AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

SEPTEMBER 15, 1959

The First Compact Car
FORD FALCON
Illustrated

EXCLUSIVE . .

COMPLETE DETAILS 1960 CHRYSLER LINE

IHC PRODUCTION METHODS, PART II

CHEVROLET TRUCK DESIGN DETAILS

Right: Four-door Falcon at Proving Ground, 60% Grade. Stories, Pages 60 and 64.

Automotive Engineering

MANAGEMENT • DESIGN • PRODUCTION

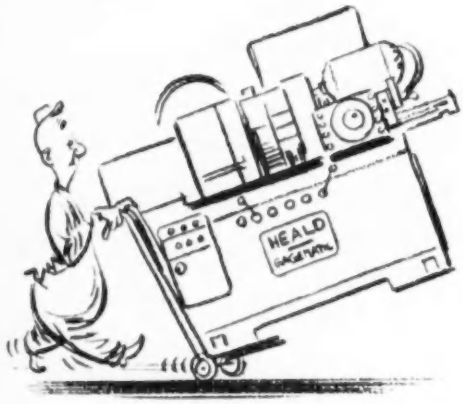
WHY WAIT

longer

for a new machine?

Chances are, Heald has it

IN STOCK!



As a result of Heald's recently instituted stock machine program, the most popular types and sizes of Heald precision finishing machines are normally carried in factory stock at Worcester. Any time you can buy a *stock machine*, and supply your own fixtures and tooling, you get these important advantages . . .

1. FAST DELIVERY. Instead of waiting for several months for a specially built machine, your stock machine will be on its way in a matter of days or weeks.

2. LOWER COST. By eliminating special engineering and drafting, you get a top-quality basic machine at lowest possible cost.

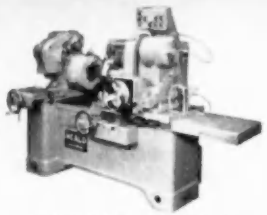
3. UNLIMITED VERSATILITY. Every Heald stock machine has the inherent versatility of speeds, feeds and cycling that permits easy adaptability to virtually any combination or sequence of operations.

If you need a standard machine in a *hurry* — and at minimum cost — it will pay you to check Heald on the availability of a *stock machine* that will meet your requirements.

THESE STANDARD HEALD MACHINES ARE NORMALLY CARRIED IN STOCK

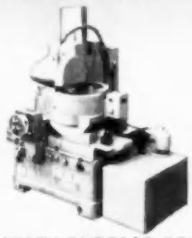
BORE-MATICS

Model "0"
Model 121
Model 221
Model 321
Model 421
Model 222
Model 322
Model 422



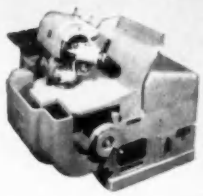
INTERNAL GRINDERS

Model 171 Size-Matic
Model 171 Gage-Matic
Model 271 Plain
Model 271 Size-Matic
Model 271 Gage-Matic
Model 271 Tool Room
Model 272 Basic
Model 273A Universal



ROTARY SURFACE GRINDERS

Model 161 6"
Model 261 16" Plain
Model 261 16" Automatic
Model 361 24" Plain
Model 361 24" Automatic



TOOL SHARPENING MACHINES

Model 3
Model 4

HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York • Syracuse

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(Advertisement)

III

KNOW YOUR ALLOY STEELS . . .
This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

What Does Grain Size Mean In An Alloy Steel?

The grain size of alloy steels is generally understood to mean austenite or inherent grain size, as indicated by the McQuaid-Ehn carburizing test. Austenite grain size should be distinguished from ferrite grain size, which is the size of the grains in the as-rolled or as-forged condition with the exception of those steels that are austenitic at room temperature. When steel is heated through the critical range (approximately 1350 to 1600 deg F for most steels, depending on the composition), transformation to austenite takes place. The austenite grains are extremely small when first formed, but grow in size as the temperature above the critical range is increased, and, to a limited extent, as the time is increased. It is apparent, therefore, that both time and temperature must be constant in order to obtain reproducible results.

When temperatures are raised materially above the critical range, different steels show wide variations in grain size, depending on the chemical composition and the deoxidation practice used in making the heat. Heats are customarily deoxidized with aluminum, ferrosilicon, or a combination of deoxidizing elements. Steels using aluminum or other deoxidizers in carefully controlled amounts maintain a slow rate of grain growth at 1700 deg F, while heats finished with other deoxidizers, usually ferrosilicon, develop relatively large austenite grain size at temperatures somewhat below 1700 deg F.

The McQuaid-Ehn test is the one ordinarily used for determining grain size. Steel is rated with a set of eight ASTM charts that are compared one at a time with a specially prepared steel sample until one is found to match. Number 1 grain size, the coarsest, shows 1½ grains per sq in. of steel area examined at 100 diameters magnification. The finest chart is Number 8, which shows 96 or more grains per sq in. at the same magnification.

Properties Affected by Grain Size

Fine-grain steels (grain sizes 5, 6, 7, and 8) do not harden as deeply as coarse-grain steels, and they have less tendency to crack during heat-treatment. Fine-grain steels exhibit greater toughness and shock-resistance—properties that make them suitable for applications involving moving loads and high impact. Practically all alloy steels are produced with fine-grain structures.

Coarse-grain steels exhibit definite machining superiority. For this reason a few parts which are intricately machined are made to coarse-grain practice.

The correct specification and determination of grain structure in steel is a subject that has been given long study by Bethlehem metallurgists. If you would like suggestions on this or any other problem concerning alloy steels, these men will be glad to give you all possible help.

In addition to the entire range of AISI alloy steels, Bethlehem produces special-analysis steels and the full range of carbon grades.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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METAL SHOW • Booth 528
International Amphitheater
Chicago • November 2-6

How B&W JOB-MATCHED TUBING helps you design a better end product

You can get the right tube for your job with B&W Seamless Mechanical Tubing because you can choose from:

- ... a range of sizes, grades, and finishes for design flexibility
- ... a variety of heat treated conditions for the most suitable mechanical properties
- ... special shapes and prefabricated forms to improve design and simplify production.

These are just some of the reasons it pays to specify B&W Job-Matched Mechanical Tubing. Call your local B&W District Sales Specialist, or write for Bulletin TB-361 for full information. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA-9009-SM4

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

SEPTEMBER 15, 1959 VOL. 121 No. 6

Features • • •

Features of Chrysler Corporation's '60 Cars
Continuing the practice established some years ago, we are describing and illustrating the principal mechanical changes and improvements in the Chrysler Corporation's new cars in advance of the announcements to be presented next month. Page 53.

New Mercedes-Benz Sedan
The latest Mercedes-Benz model has a completely new body with an overall length of 187 in. The rear axle, of the single-joint swing type, now incorporates an additional spring of the same design as on the 300-SL sports car. Page 59.

Ford's Compact Car, the Falcon
One of the first 1960 cars to be announced is the Ford Falcon. Unlike some of the imports, this compact car will accommodate six passengers, and has excellent all-around performance. It has a unitized body construction, eliminating the separate chassis frame. Its 144 cu in. engine develops 90 hp. Page 60.

Chevrolet Trucks Have Torsion Bar Springs
Independent front wheel suspension and torsion bar springs are among the features of Chevrolet's new commercial vehicles. These and other changes and advances are described in a well-illustrated article. Page 62.

Making the Ford Falcon Rear Axle
Ford's new compact car has a rear axle of a design which differs from others in the Ford line. Production of this new component in the Ford Sterling Chassis Parts Plant is described by Joseph Geschelin. Page 64.

Machining Engine Parts at IHC
Operations on crankshaft and cylinder heads at the Indianapolis engine plant of International Harvester Co. are described in an article by Joseph Geschelin, Detroit Editor of AUTOMOTIVE INDUSTRIES. This is Part II of a two-part article. Page 66.

New Aircraft Handlers
Two aircraft handlers have been brought out in England—one carries the plane's nose wheel, the other rotates a landing wheel. The latter is powered by a small Diesel engine. Page 69.

Vinyl Upholstery Made in Ford Plant
At the new Mt. Clemens, Mich. Chemical Products Plant of the Ford Motor Co. some 250 combinations of grain and color in upholstery will be produced for 1960 cars. The setup is described and illustrated in an article by Joseph Geschelin. Page 70.

Lightweight Missile Handling Trailer
Good reliability must be designed into ground handling equipment for missiles. Light weight also is important. These qualities are combined in a trailer made by United Manufacturing Co. Page 72.

50 New Product Items, And Other Features Such As:
Industry Statistics, News of Machinery Industries, Airbriefs, Trends in the Construction Equipment Industry, and Government Contract Awards.

. . . continued on next page

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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Second Class Postage Paid at Philadelphia, Pa. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 50¢. Statistical and Products Guide Issues, $1.00 each net.

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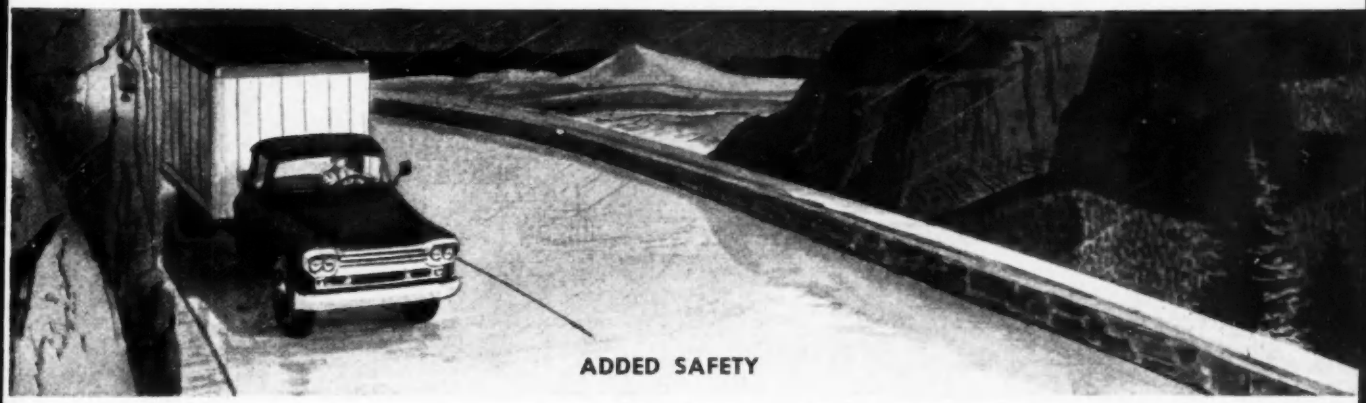
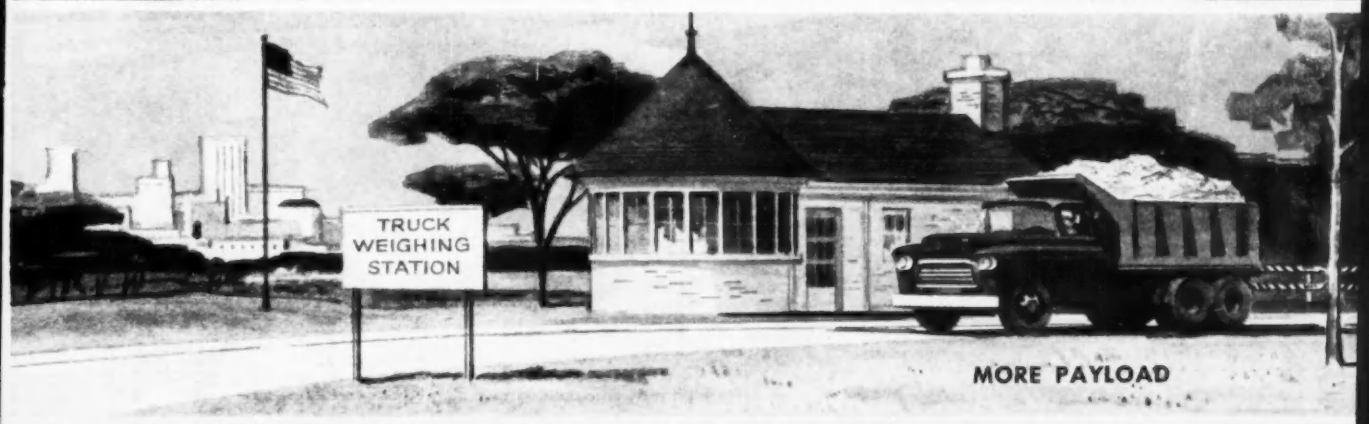
REASONS WHY VACUUM POWER BRAKING IS FIRST CHOICE ON TRUCKS



ADDED SAFETY



MORE PAYLOAD

LESS FIRST COST—LOWER MAINTENANCE

WITH BENDIX HYDROVAC* LEADING ALL OTHER MAKES COMBINED

When it comes to power braking, the overwhelming choice on trucks is vacuum power, with Hydrovac leading all other makes combined.

You can bet your bottom dollar that such overwhelming preference is based on solid reasons. For example:

By saving dead weight, vacuum power can add several hundred pounds to *payload*, and earn extra dollars, as ton-miles build up.

In addition, there is the vital *safety stand-by* of instantly available physical braking, instead of "no power, no brakes!"

Then, with vacuum power there is less first cost and less expense for maintenance, and it is completely free of compressor drain on engine power.

Any way you look at it, it will pay you to make Hydrovac Vacuum Power Brakes your choice for the best in power braking . . . for the most in value.

*REG. U.S. PAT. OFF.

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

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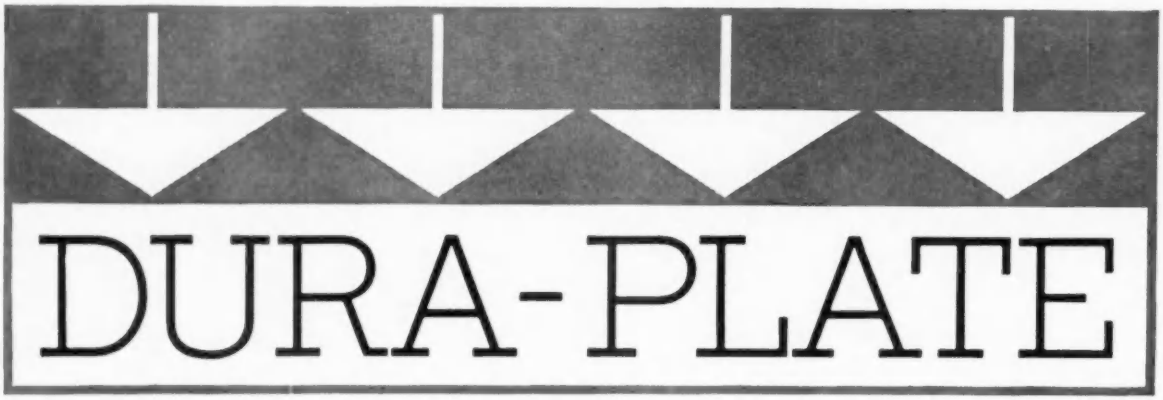
BROWN LIPE CHAPIN



New Chrome Plating advance gives bright work new dimension in durability!

Here's a shining example of the many benefits available for your products at Brown-Lipe-Chapin. It's Brown-Lipe-Chapin's new DURA-PLATE! This new and unique process of chrome plating gives your product active sales appeal with the rich quality of gleaming chrome . . . and adds a new depth of durability that will last the life of your product.

DURA-PLATE consists of two layers of laminar and columnar nickel with a layer of chrome *five times as thick* as produced by conventional methods. The result is a surface almost impenetrable to corrosion. DURA-PLATE can be applied on any product made of steel, or on zinc die castings . . . at no extra cost!

DURA-PLATE is the result of the advanced research, the development of new techniques and thorough testing that continue at Brown-Lipe-Chapin to help make your products better.

DURA-PLATE is typical of the many benefits you get from Brown-Lipe-Chapin when you call on their extensive facilities for die casting, metal stampings of all kinds, electroplating, anodizing and painting.

If you're looking for a bright difference in your product, call on Brown-Lipe-Chapin, Division of General Motors Corporation, Syracuse, New York.

GM GENERAL MOTORS

RELIABILITY by BROWN·LIPE·CHAPIN

DIVISION OF GENERAL MOTORS CORPORATION

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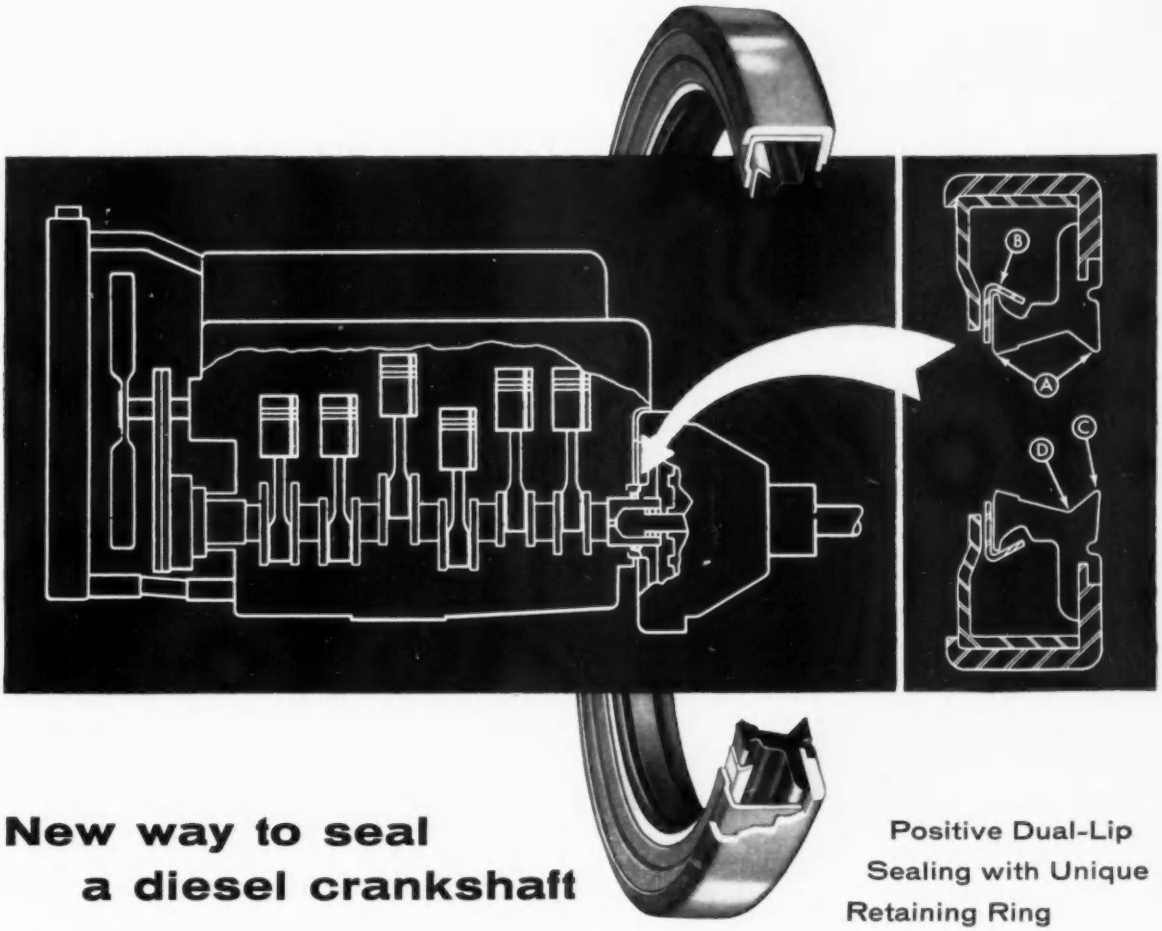

New way to seal a diesel crankshaft

Positive Dual-Lip Sealing with Unique Retaining Ring

The tremendous work loads being put on heavy-duty diesels call for a new look at sealing specifications. Stresses on the crankshaft often cause eccentricity with runout as much as .042 in. This makes holding a tight seal at the shaft rear extension with a standard seal design extremely difficult if not impossible. Another consideration is high working temperature—up to 300 deg. F.

Newest provision for this condition on a typical diesel is shown here. This unique yet simple modification of standard Victor oil seal design maintains positive mating of shaft and sealing element under any shaft divergence. The element—a silicone elastomer compounded by Victor—is good to 400 deg. F. intermittently.

In place of the usual garter spring, Victor engineers designed a unique retaining ring, loosely mounted over the sealing lip surface. The ring retains proper lip pressure while it permits the sealing element to follow the exact eccentricities of the shaft.

Have you a shaft sealing problem—or any problem involving oil seals or gaskets? Victor can help you solve it most economically. Contact your Victor Field Engineer or the factory. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian Plant: St. Thomas, Ont.

A Basic design is Victor Type K6 with dual-lip standard construction. Provides maximum fluid retention and exclusion of foreign matter. Sealing element is silicone rubber, integrally molded and bonded to steel case.

B Metal retaining ring loosely mounted over the lip replaces usual garter spring. Allows expansion of element when seal is installed on shaft, yet confines element and retains even lip pressure in operation.

C Outer or secondary lip is molded with very little interference, avoiding danger of turning back lip on installation. When shaft enters primary lip, interference of secondary lip is increased through lever action.

D Lubricant applied between lips before installation permanently lubricates the seal, reduces frictional drag, extends seal life.

A complete reference manual for designers—Victor Oil Seal Engineering Catalog No. 305. Sent on request.

VICTOR

Sealing Products Exclusively

GASKETS • OIL SEALS • PACKINGS • MECHANICAL SEALS

For a single tank cleaner to do many jobs

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

"RUSTRIPPER" gives you the "universal" tank cleaner . . . removes rust, scale, paint, soils

Here is a remarkable alkaline material with powerful cleaning and chelating action. It conquers a wide variety of soils. In a tank of Oakite RUSTRIPPER, you can remove scale and rust with complete safety. It strips tough paints and phosphate undercoatings with ease. It cleans off metallic smuts, light shop soils, discolorations.

Look at its performance in shop service: "Aircraft parts freed of scale with boiling soak, instead of sand blasting" . . . "oil, welding flux, rust removed in job plating" . . . "soaked steel wrenches give brighter plate" . . . "removes all rust, scale, carbonized oil from diesel liners prior to plating" . . . "displays amazing solution life even though worked very hard" . . . "eliminates pickling and precleaning for barrel-plated screws" . . . "does to bolts in 3 minutes what took pickling 40 minutes". *And that's just a sample.*

Write for Bulletin 9651. Better yet, ask the Oakite man. Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

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years' leadership in industrial cleaning

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CALENDAR

OF COMING SHOWS AND MEETINGS

Steel Founders' Society of America, 57th fall meeting, The Homestead, Hot Springs, Va. . . . Sept. 21-22

Instrument Society of America, 14th annual instrument-automation conference and exhibit, International Amphitheater, Chicago, Ill. . . . . Sept. 21-24

Industrial Nuclear Technology Conference, Morrison Hotel, Chicago, Ill. . . . . Sept. 22-24

ASME-AIEE National Power Conference, Hotel Muehlebach, Kansas City, Mo. . . . . Sept. 27-30

Association of Iron & Steel Engineers, annual convention, Sherman Hotel, Chicago, Ill. Sept. 28-Oct. 1

American Welding Society, national fall meeting, Sheraton-Cadillac Hotel, Detroit, Mich. . . . Sept. 28-Oct. 1

Paris Automobile Show . . . . . Oct. 1-11

Truck Body & Equipment Association, annual convention and exhibit, Sherman Hotel, Chicago, Ill. . . . . Oct. 5-7

SAE National Aeronautic Meeting, Ambassador Hotel, Los Angeles, Calif. . . . . Oct. 5-9

Institute of the Aeronautical Sciences, Anglo-American Conference, Hotel Astor, New York, N. Y. . . . . Oct. 5-16

Powder Metallurgy Parts Manufacturers Association, annual meeting, Sheraton-Cadillac Hotel, Detroit, Mich. . . . . Oct. 6-7

Gray Iron Founders' Society, annual meeting, Fairmont Hotel, San Francisco, Calif. . . . . Oct. 7-9

American Vacuum Society, sixth national symposium on vacuum technology, Sheraton Hotel, Philadelphia, Pa. . . . . Oct. 7-9

ASTE semi-annual meeting, Chase-Park Plaza Hotels, St. Louis, Mo. . . . . Oct. 8-10

ASTM Pacific Area National Meeting, Sheraton-Palace Hotel, San Francisco, Calif. . . . . Oct. 11-16

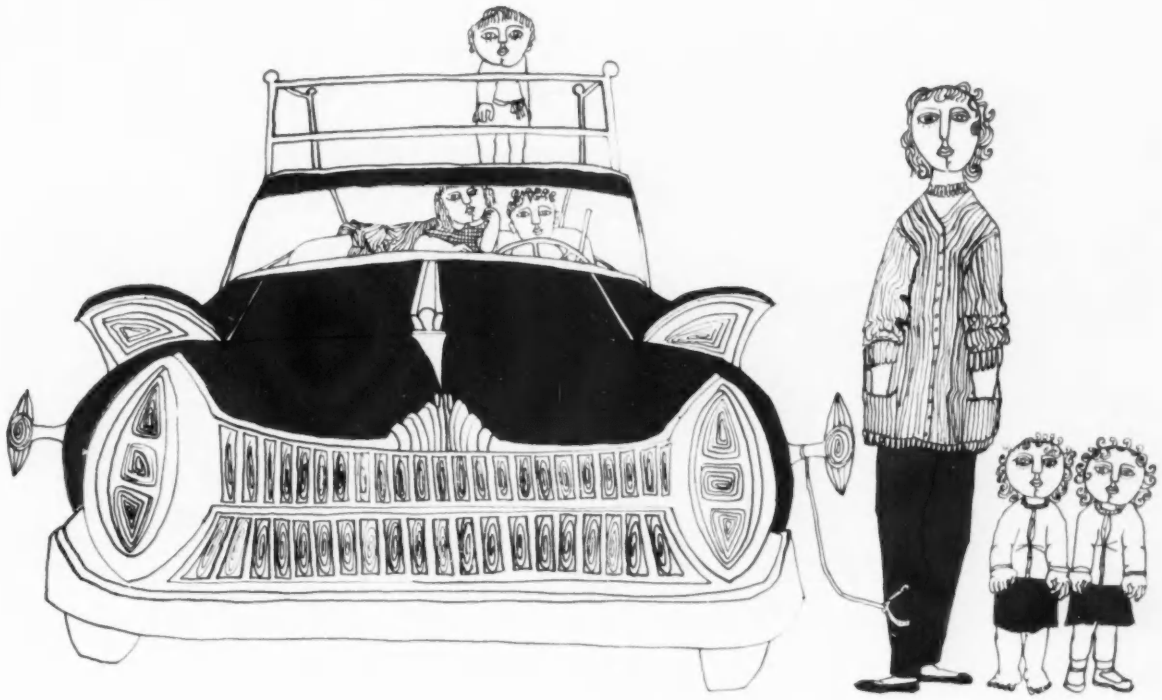
SPE National Technical Conference, Ambassador Hotel, Los Angeles, Calif. . . . . Oct. 13-14

Magnesium Association, annual convention, Hotel Roosevelt, New York, N. Y. . . . . Oct. 19-20

National Conference on Standards, Sheraton-Cadillac Hotel, Detroit, Mich. . . . . Oct. 20-22

SAE National Joint Transportation, Diesel Engine, and Fuels and Lubricants Meeting, La Salle Hotel, Chicago, Ill. . . . . Oct. 26-30

Mom-the-chauffeur



When Mom loads the kids in the wagon and starts off to meet the 6:15, she doesn't think of gears and bearings. She tramps on the gas, hits all the chuckholes and expects the car to shift for itself.

And when the lord and master takes over the helm, he spins the wheels in the cinders, shoots out ahead of the crowd and passes everything on the highway. He can't hear the gears howling in anguish. He's fast on the road but slow getting to the grease rack.

It's a good thing that the tough alloy steels go into gears and bearings, and the finest of these are USS CARILLOY Steels. They offer the strength, hardness and shock resistance needed to withstand abuses dealt out by the wildest highway cowboy.

If your problem is different, you may need the help of our *Service Metallurgists.* These men have had years of training and wide experience in the application of USS CARILLOY Steels. They are available for consultation anywhere in the United States or Canada, without charge. They can help you solve specific problems.

For more information on USS CARILLOY Steels, contact our nearest sales office or write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

...how four of the engineering help you...the

1 The advanced product and process engineers at each of our plants are available to assist you with the casting design considerations. It is Central Foundry's practice to suggest design changes that ordinarily do not affect the part functionally, but often reduce casting weight, thus reducing casting costs. Your blueprints are returned to you with parting line, coring and gate locations as well as suggested changes in casting design clearly marked.

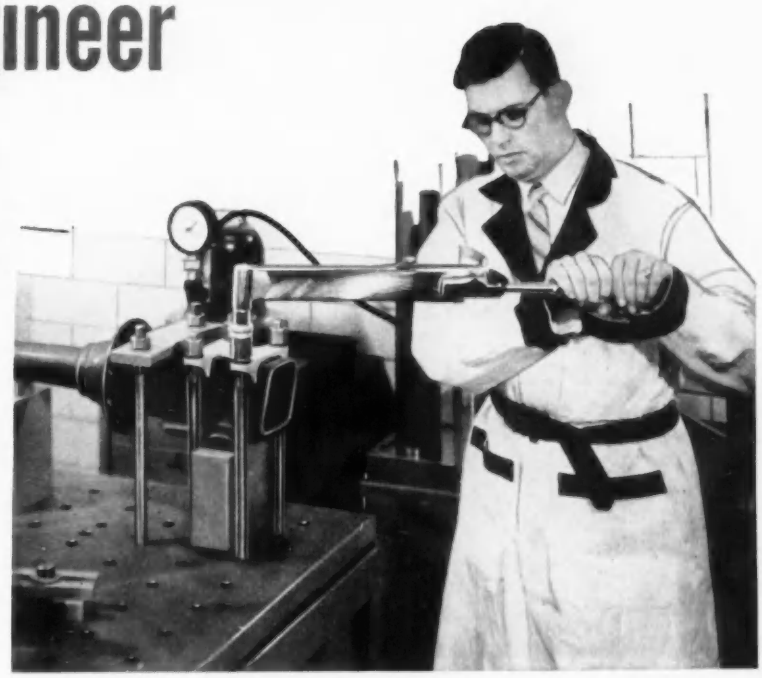
Our engineering staff is specialized to give you expert assistance in each of the metals Central Foundry produces. When you are considering castings of ArmaSteel, malleable iron or grey iron to be cast in either green sand molds or by the more exacting shell mold process, contact the sales department of Central Foundry Division.

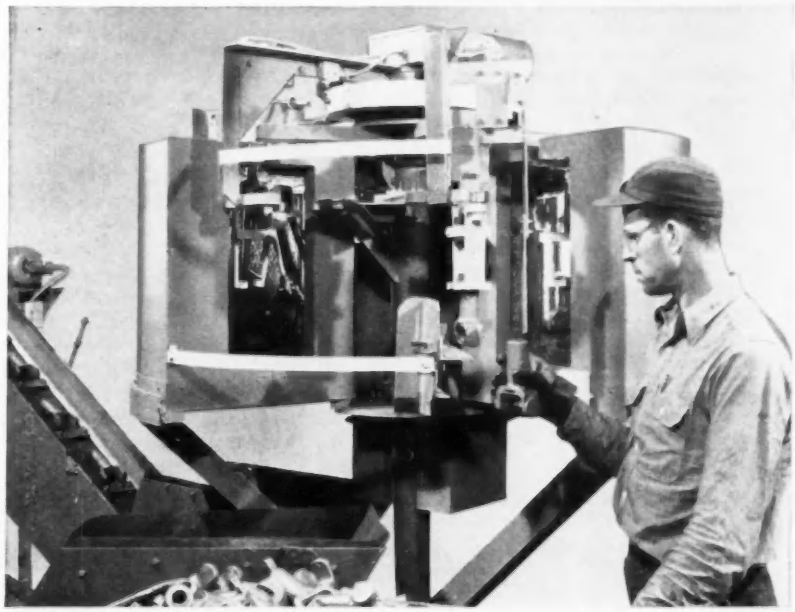
2 Cobalt 60 radiography, a fast, positive method of detecting sub-surface defects, has replaced time consuming breaking, cutting and etching of castings, formerly used by the foundry industry to check new parts for soundness. This technique does not demand destruction of the part and gives positive location of any defects. With radiographs as a guide, our engineers can make necessary changes in gating, feeding and general design that assure quality castings at reduced cost, and do it in hours compared to days required for breaking or cutting.

CENTRAL FOUNDRY DIVISION

services at Central Foundry design engineer

3 Stress Analysis is also used at Central Foundry in the design or redesign of castings to reduce weight and improve mechanical strength. By an accurate study of stress, both statically and dynamically, Central Foundry engineers are able to suggest design changes, to put metal where it is needed, remove excess material, to recommend the best material for your part and thus assure the highest quality castings at the lowest possible cost.





4 Sonic testing is an electronic listening device developed by Central Foundry that automatically distinguishes between the vibrations of good and faulty castings and sorts them accordingly. The sonic testing machine, much faster and more accurate than visual inspection, eliminates human error and is ideally suited to high production of castings designed for critical applications.

Central Foundry, with plants in Saginaw, Michigan, Defiance, Ohio, and Danville, Illinois, has the vast facilities and engineering services necessary to deliver, on schedule, quality castings in production quantities. Our sales engineers, product development engineers, foundry engineers and modern engineering services are all available to help you get quality castings . . . at low cost . . . in less time.

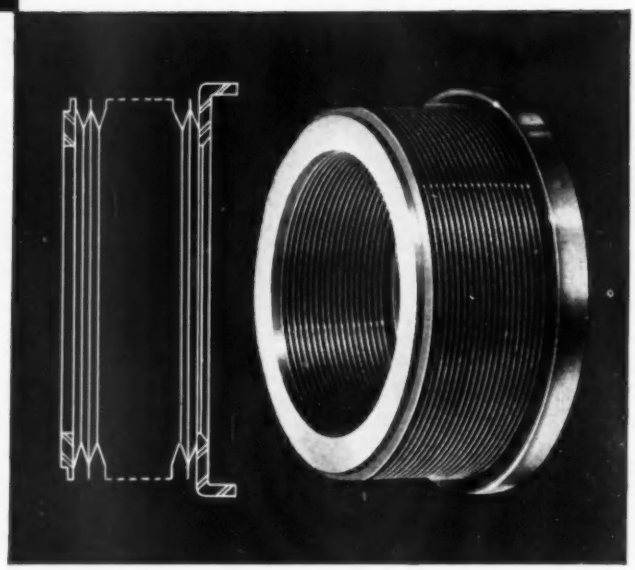
MEMBER MALLEABLE FOUNDERS' SOCIETY

GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 24

Circle 111 on Inquiry Card for more data

C/R DESIGN NOTES

How C/R's New Metal Bellows Seal Meets Seemingly Impossible Operating Conditions



Operating Ranges

Temperature	−400° to 1000° F.
Pressure	500 psi
R.P.M.	80,000 plus

These known operating ranges indicate the function of this seal. It is designed for applications where temperatures and mediums to be sealed forbid the use of any organic materials. Typically, these applications include fuel pumps, compressor power units and turbine starters characteristic in rockets and missiles. Other applications include mechanisms which are exposed to a high level of radioactivity.

Design Advantages

The C/R metal bellows seal consists of a metal bellows — a welded homogeneous unit which is secured at one end — and a carrier ring in which the sealing face is mounted. The seal does not contact the shaft. It is stationary, and the only rubbing surfaces are the sealing face and mating ring. These surfaces are precision lapped to provide a positive seal with minimum friction. At any given pressure, the seal can be designed to maintain proper and constantly effective face loads. It orients immediately to run-out and will resist any torques it is subjected to in operation. The design has high end-play tolerance: Chicago Rawhide engineers have deflected a bellows .100 in. for three million cycles at 1750 cpm and at a temperature of 500° F. with no adverse effects.

A further advantage is relatively light weight and compactness. The C/R metal bellows seal can be designed for minimum axial and radial space. Axially, complete seals can be produced within a ¼ in. cross-section. Radially, dimensions are comparable with conventional end face seals.

The C/R metal bellows seal can also be designed with an extremely low coefficient of expansion. The importance of this factor becomes apparent with the fact that in many applications the operating temperature may change hundreds of degrees in a very few seconds.

Mediums To Be Sealed

Virtually any known liquid or gas may be positively sealed with this design, depending upon duration or service life. From a practical viewpoint, the C/R metal bellows seal is the best design for the sealing of cryogenic and high-energy fuels such as LOX, hydrogen peroxide, fluorine and other missile and rocket propellants.

Where possible, lubrication of the two sealing faces is desirable to prolong service life. However, the medium being sealed commonly acts as the lubricant and may be merely hot gas.

Materials

Sealing faces and mating rings for the C/R metal bellows seal are available in a variety of materials including carbons, carbides, ceramics and various alloyed metals for both high temperature and corrosion resistance. The bellows can be furnished in any of several metals and alloys such as stainless steel, Monel, Inconel X, Ni-Span C and other special alloy steels.

Consult C/R Engineers

Each application for the C/R metal bellows seal is essentially a custom-design and an intimate knowledge of all conditions to be encountered must be known by Chicago Rawhide engineers to produce the correct combination of properties in the seal. Then, whether you require five, fifty or five thousand seals, Chicago Rawhide will design and produce the correct seal to solve your problem.

Helpful Design Data:

We will gladly furnish you with a design guide and space envelope data concerning the C/R Metal Bellows Seal. Just write for Bulletin MBS-1 on your company letterhead.

CHICAGO RAWHIDE MANUFACTURING COMPANY

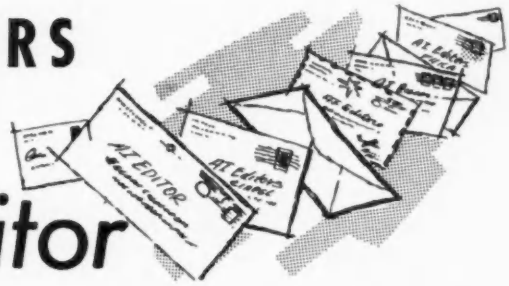
1205 Elston Avenue • Chicago 22, Illinois

Offices in 55 principal cities

In Canada: Chicago Rawhide Mfg. Co. of Canada, Ltd., Brantford, Ontario

Export Sales: Geon International Corp., Great Neck, New York

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

TRIBUTES TO PROGRESS

You have an excellent magazine, which I read from time to time. Of course, all of us are very busy, but we do make every effort to cooperate with publications and the press, and if I can be of any assistance to you, I will be most happy to do so.

Carl L. Hecker
President
The Oliver Corp.
400 West Madison St.
Chicago 6, Ill.

Congratulations on your improvement in AI. The publication is considerably livelier with the pictorial cover and fast-closing news section. In general, your "new graphic look" adds considerable appeal. The article on automobile industry participation in A.S.A. (July 15 issue) was especially illuminating.

John R. Hurley
Manager
Public Relations
Batten, Barton, Durstine & Osborn, Inc.
Penobscot Bldg.
645 Griswold Avenue
Detroit 26, Mich.

This publication (AUTOMOTIVE INDUSTRIES) is regularly received at the office, and I can confirm that the editorial features are well illustrated and presented.

H. E. Robison
Staff Admin. Engineer
Massey-Ferguson, Inc.
Detroit 32, Mich.

HYDRAULIC RETARDERS

No doubt your good magazine may help us by providing the names of American manufacturers who make hydraulic braking devices to be used on Diesel-engine-driven trucks and buses when running downhill. These braking devices are based on the same principle as that of the hydraulic dynamometers used to test engines.

To be more specific, we have the problem of increasing braking effectiveness of some European trucks and buses on which we are mounting General Motors Diesel engines.

Ing. Alfredo Christlieb
General Manager
Sociedad Electro-Mecanica
Mexico 4, D.F.

● *Try Thompson Products Michigan Division, Thompson Ramo Wooldridge, Inc., 34201 Van Dyke Ave., Warren, Mich. —Ed.*

BRAKE BOOSTERS

In reference to the request contained in the letter from Mr. J. G. MacDonald, Dominion Road Machinery Co., Ltd., we are enclosing catalog information on our MICO Hydraulic Power Brake, used by people such as Allis-Chalmers and Pettibone New York on their graders.

G. J. McGrath
Sales Manager
Minnesota Automotive, Inc.
1101 North Front
Mankato, Minn.

We are enclosing a copy of a letter addressed to Mr. J. G. MacDonald, Dominion Road Machinery Co., Ltd., Goderich, Canada, describing our line of brake boosters. Also enclosed please find a brochure of a HYDROEASE Brake unit for passenger cars. Many of these units are installed and sold by dealers to automobile owners.

A. J. Jansson
President and General Manager
Hydroease Corp.
16740 Westmoreland
Detroit 19, Mich.

IN FASTENERS SOUTHERN IS

SERVICE

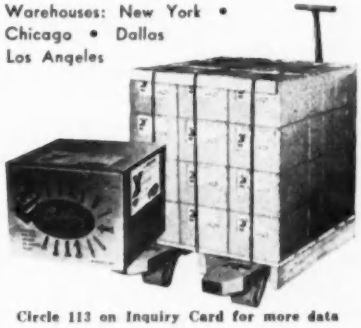
Southern Screw has built service into its policies and products for the past 13 years. Its service has helped industries to solve serious production problems by reducing down-time, cutting reject losses, improving product quality and by reducing inventory and handling problems.

Put Southern's famous one-source service to work for you in one or more of these problem areas. When you do, you'll find that service is more than a word at Southern. It is an integral part of the finest USA-made fasteners money can buy. Send your order of inquiry to Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

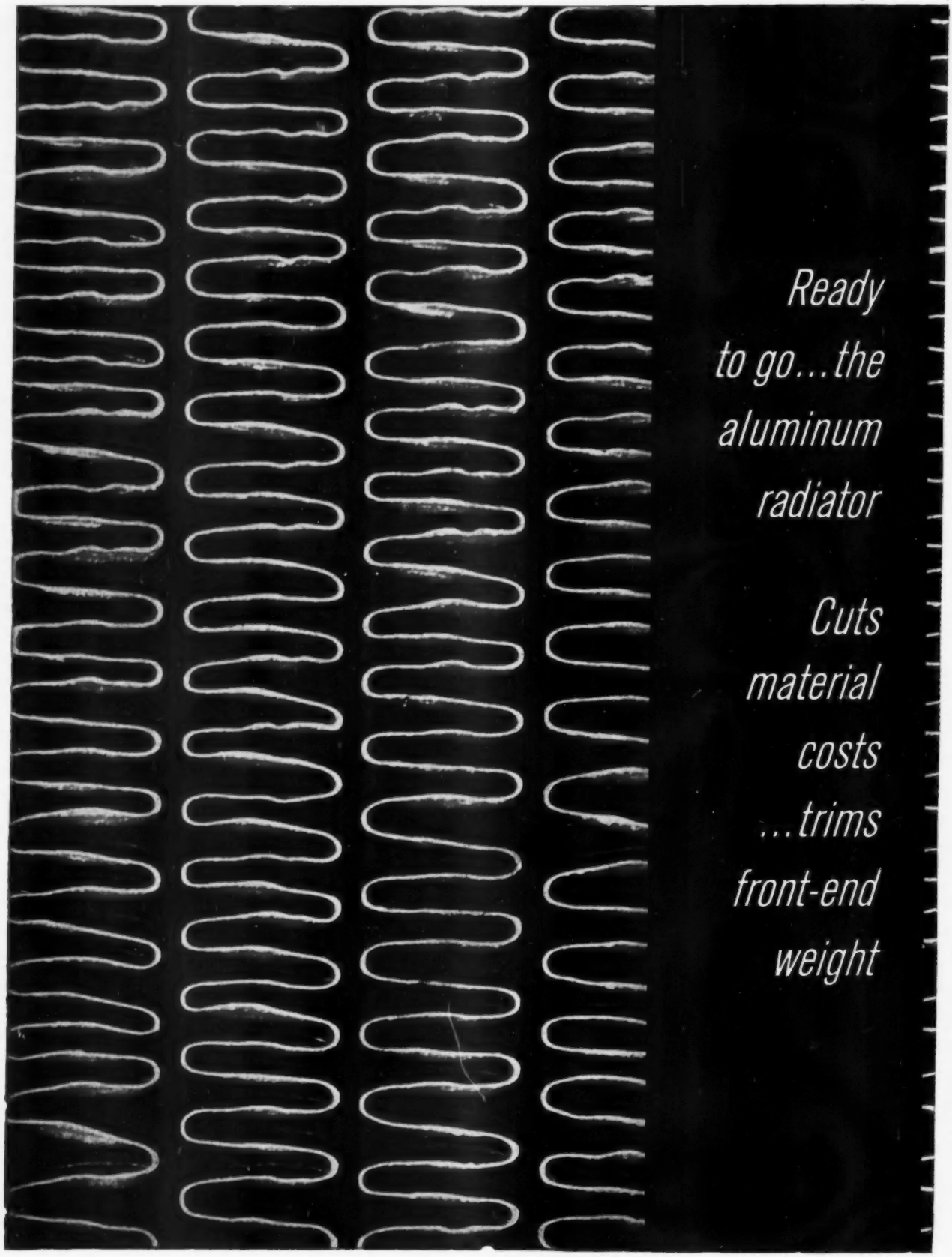
Tapping Screws ● Machine Screws & Nuts ● Wood Screws ● Stove Bolts ● Carriage Bolts ● Dowel Screws ● Hanger Bolts ● Drive Screws

Manufacturing and Main Stock in Statesville, North Carolina

Warehouses: New York • Chicago • Dallas Los Angeles



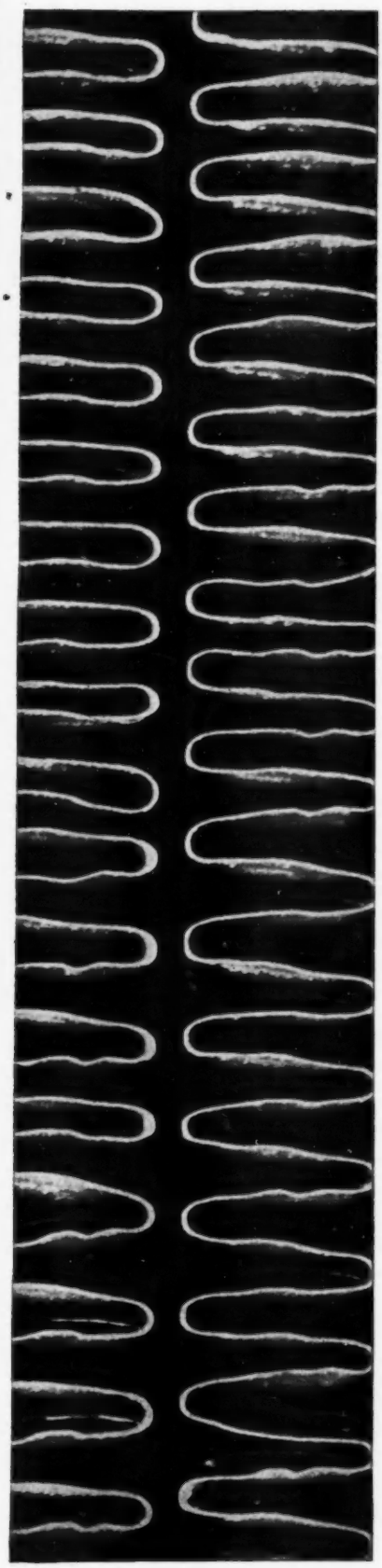
Circle 113 on Inquiry Card for more data



Ready to go... the aluminum radiator

Cuts material costs ...trims front-end weight

(*Advertisement*)



The aluminum fin radiator is ready for production lines right now. Years of research and development by Alcoa engineers have proved its performance and dependability. The moment production changeover can be amortized profitably, aluminum radiators will immediately offer several distinct advantages. Alcoa "solder sheet" may even mean that no change will be required in solder composition.

Lower Material Cost—Because you get three times as much metal per pound with aluminum, there is a substantial saving in basic cost—even when other metals are competitively priced on a per pound basis. And additional economies are realized with aluminum.

Reduced Weight—Decreasing the weight of the radiator by one-third or more through the use of aluminum is a major step in the solution of overweight problems in the front end.

Fabrication—Aluminum fin-brass tube radiators are fabricated by the same techniques employed with other metals, using solder specifically designed for aluminum—or using standard production solders for "solder sheet" fins.

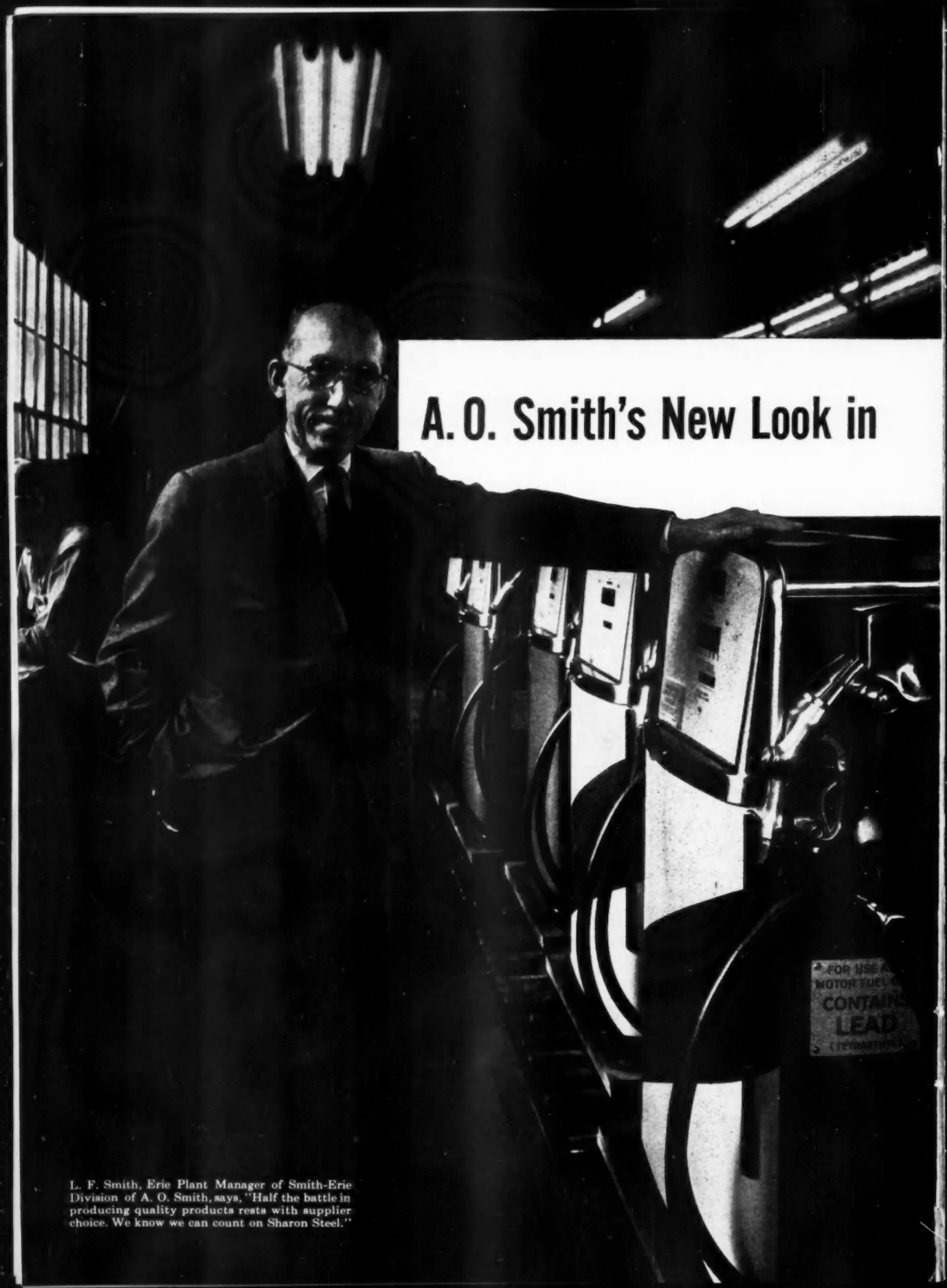
The *all*-aluminum radiator is also a practical reality. All-aluminum air-conditioning evaporators and condensers are in production now. Some changes in facilities and procedures are required for suitable brazing operations. Road test results on this construction are excellent! The economies and improved ability to withstand pressure emphasize the suitability of brazed all-aluminum construction.

Let Alcoa Help—Alcoa has over a half century of experience in aluminum research, plus the largest and most complete facilities in the industry. These are available to you in utilizing an all-aluminum radiator and for other applications where aluminum can work for you. Write Aluminum Company of America, Development Division, 1786-J Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

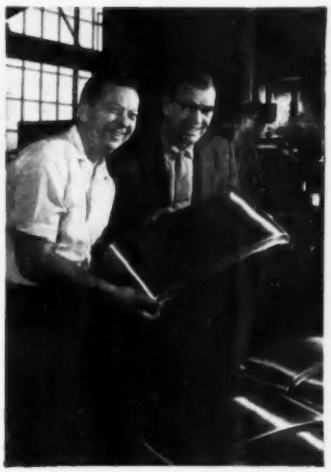
Your Guide to the Best in Aluminum Value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV



L. F. Smith, Erie Plant Manager of Smith-Erie Division of A. O. Smith, says, "Half the battle in producing quality products rests with supplier choice. We know we can count on Sharon Steel."

P. R. Fishburn, Manager of Production and R. W. Swank, Manager of Research and Development, agree on selection of Sharon Stainless.



Charles MacIntosh, Supt. of Assembly and Harold L. Ripley, Supt. of Machine Shop, like the way Sharon Stainless handles in production.

Gas Pumps Begins with..

Quality Steels

Sharon Stainless Shrugs Off Weather, Corrosive Atmospheres

A. O. Smith Corporation has a reputation for quality that can only come from years of supplying products that perform as they were meant to. Such a reputation is a valued business commodity and A. O. Smith works hard to protect it. That's the reason they work with suppliers like Sharon Steel—to make certain they get the finest materials—right from the start.

In their new gasoline pump line A. O. Smith's Smith-Erie Division wanted a modern unit that would not only look well, but one that would withstand the ravages of weather and corrosive atmospheres, yet be easy to care for. To meet these requisites they specified stainless steel. To make certain of the best in stainless, they selected Sharon Quality Stainless Steel. *Sharon Steel Corporation, Sharon, Pa.*

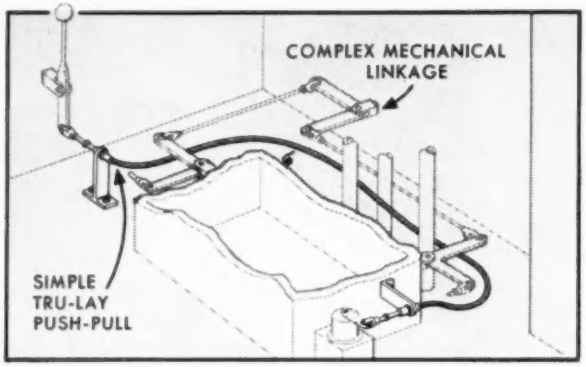
Smith and his Purchasing Agent, J. E. Robison, like Sharon's "Service after Sale" policy. Here they talk shop with Sharon salesman Gordon Garrett.

SHARONSTEEL **SHARON** *Quality* **STEEL**

Circle 115 on Inquiry Card for more data

TRU-LAY *PUSH*-PULL CONTROLS PROVIDE ACCURATE, DEPENDABLE REMOTE CONTROL FOR HUNDREDS OF PRODUCTS

• If your products involve remote control—electrical, hydraulic, pneumatic or direct—TRU-LAY PUSH-PULL FLEXIBLE CONTROLS can help solve your design problems. They provide positive remote control over long or short distances—up to 150 feet from the control point. Because they operate while flexing, they can snake around obstructions. They will not buckle. They are ruggedly constructed, easily installed and operated, sealed against dirt and moisture, and will handle jobs with as much as 1,000 lbs. input. PUSH-PULL CONTROLS are simple, have but one moving part, are noiseless, and give a lifetime of accuracy. Mechanical linkages, on the other hand, are complex. Unlike PUSH-PULL CONTROLS, they are made of many parts, wear at many points, and produce increased backlash, lost accuracy, and vibration rattles.



Sizes and Operating Heads to Fit Your Design

Control Dimension	Minimum Recommended Radius in Inches	Maximum Input Load in Pounds (Dependent on Travel)
3/32"	2	30
1/8"	3	65-125
3/16"	5	115-175
1/4"	6	300-600
5/16"	8	700-1,000

Heavy Duty • For use where rugged duty prevails, but where operation must be smooth and accurate. Meets all requirements for dependability and life.

Light Duty • Gives smooth, accurate and dependable performance at low cost. Available with your choice of several types of knobs.

Selective Friction • Amount of friction can be changed to meet individual requirements of the operator or application. Friction constant at any setting.

Position Lock • A slight turn of the T-type handle locks the control in any position. Available in two sizes for light and heavy-duty applications.

Micro Control • Push or pull the knob for instantaneous response, then rotate knob for vernier adjustment. Built for smooth, efficient operation on any job.

PUSH-PULL DATA FILE shows how to simplify, improve design

PUSH-PULL CONTROLS are solid as a rod and flexible as a wire rope. They're factory-lubricated for life, unaffected by temperature extremes, and can be adapted to practically any application. For complete details on how you can use them, write for the PUSH-PULL DATA FILE. It contains 7 engineering Bulletins which describe in detail the operation of PUSH-PULL CONTROLS, their applications, features and advantages. Our engineers will be glad to help you make TRU-LAY PUSH-PULL CONTROLS a part of your product.

PUSH-PULL CONTROLS

Automotive and Aircraft Division • American Chain & Cable Company, Inc.

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ACCO

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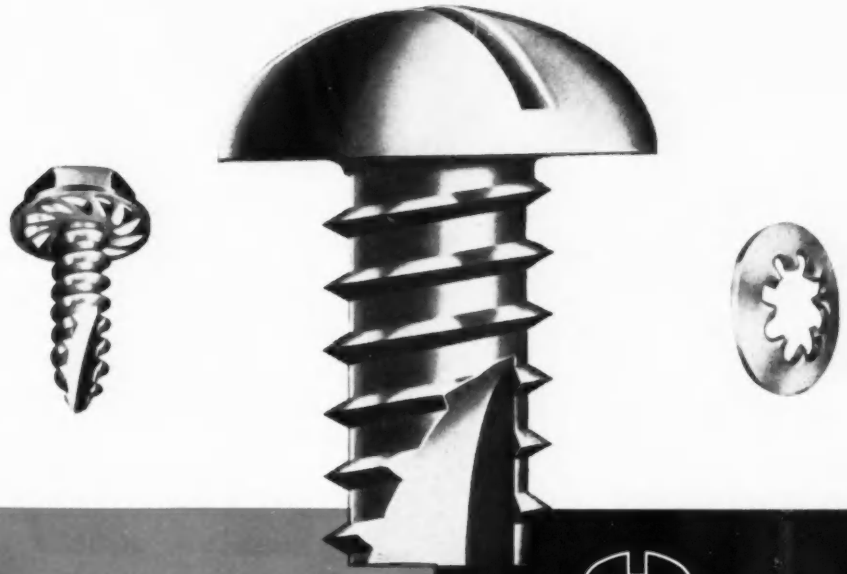
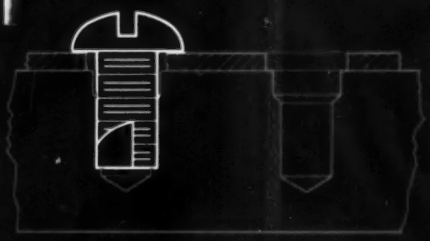


HOW TO SELECT COST-SAVING

fasteners for plastic



A TYPICAL EXAMPLE:
Cuts its own thread—

Shakeproof's® Type 25 Thread-cutting Screw saves time because it eliminates tapping. Blunt point assures maximum thread engagement and high holding strength when driven into a relatively thin panel.

Shakeproof has pioneered in developing ingenious, cost-cutting fasteners for plastic applications. The screw featured above not only taps its own hole—often it eliminates costly threaded inserts. Another Shakeproof development, the Type 17 self-drilling Nibscrew®, both drills and taps as it is driven. A Shakeproof Dished Lock Washer compensates for differential in expansion between plastic and metal . . . temperature changes won't loosen the assembly.

For highest quality fasteners that assure faster assembly and lower costs investigate the Shakeproof line. There's a Shakeproof fastener to meet your need—or Shakeproof engineers will develop one for your specific application.

WRITE FOR NEW SHAKEPROOF BULLETIN NO. 300
Shakeproof Bulletin 300 shows ten typical, profitable applications of Shakeproof fasteners on products using plastics. Offers free samples for testing. Send for your copy now.

SHAKEPROOF
"FASTENING HEADQUARTERS"®
DIVISION OF ILLINOIS TOOL WORKS
St. Charles Road, Elgin, Illinois
In Canada: Shakeproof/Fastex
Division of Canada Illinois Tools Limited, 67 Scarsdale Road, Don Mills, Ontario

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17

Dole Thermostats are standard equipment on seventeen (17) out of eighteen (18) leading passenger cars* — also most trucks, tractors and industrial motors

An outstanding reason for this tremendous acceptance is the dependability of product and the company that makes it. And each year, *more* manufacturers specify Dole Thermostats for motor temperature control. They are *sold* . . . sold on Dole's program of continuous research and development, and its constant adherence to highest standards of quality in engineering and manufacturing.

*as listed in Automotive News

CONTROL WITH **DOLE**®

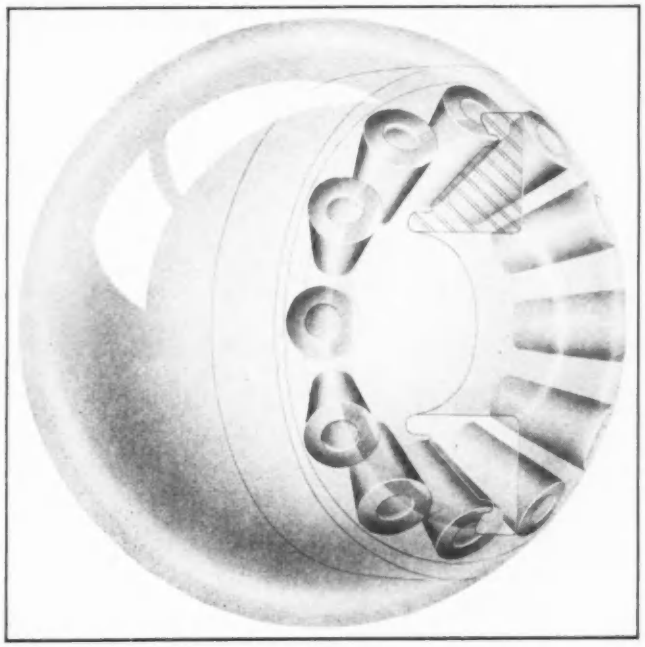
THE DOLE VALVE COMPANY 6201 OAKTON STREET, MORTON GROVE, ILLINOIS (Chicago Suburb)

(Advertisement)

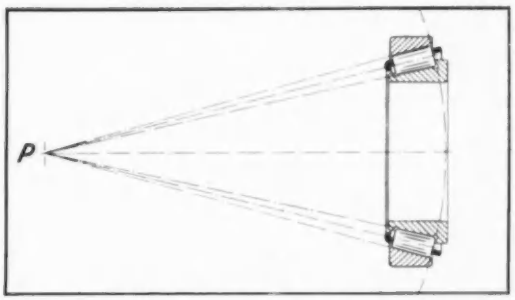
BEARING BRIEFINGS

One in a series of technical reports by Bower

SPHERICITY — ESSENTIAL TO MAXIMUM BEARING PERFORMANCE



When you require bearings, we suggest you consider the advantages of Bower bearings. Where product design calls for tapered or cylindrical roller bearings or journal roller assemblies, Bower can provide them in a full range of types and sizes. Bower engineers are always available, should you desire assistance or advice on bearing applications.



True rolling of tapered bearing elements depends upon maintaining a true spherical radius during manufacture.

For a tapered roller bearing to achieve maximum performance, i.e., maximum life and capacity under load, it must have true sphericity — a condition of bearing geometry which permits true rolling of the tapered rollers in the raceway.

True rolling in tapered bearing elements is the result of maintaining a critical geometric relationship between the raceways and the contact surfaces of each roller. True rolling is essential to maximum performance. Without it, premature bearing failure is certain.

As engineers know, a tapered roller will describe a true circle when rolled on a plane surface. *It will always roll in this one path precisely, without sliding or skewing.* But to put true rolling to work in a bearing which can carry both heavy thrust and radial loads, it is essential that the rollers *and* the raceway have a true spherical radius, or sphericity. The drawing illustrates this condition.

If each roller in the bearing were to be extended in length, while retaining its taper, it would form a cone, terminating at point "P". All cones generated from all rollers would meet at point "P", which is also the center of the hypothetical sphere shown. The surface of the sphere would *touch all points on each roller's head!*

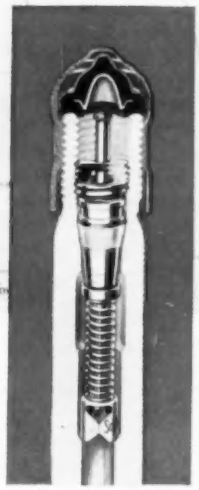
In effect, then, each roller's taper determines the radius of a hypothetical sphere whose surface, in turn, determines the correct contour for each roller head. Only when these conditions are satisfied in design, and when they are rigidly held during manufacture, will true rolling take place. In the manufacture of each Bower tapered roller bearing, sphericity is held within extremely narrow limits by means of special Bower-designed precision grinders. The consistent accuracy possible with these machines is one major reason why Bower roller bearings provide maximum performance under all speeds and loads up to the bearing's maximum rating.

BOWER ROLLER BEARINGS

BOWER ROLLER BEARING DIVISION — FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 14, MICHIGAN

The American Automotive Industry – the world's

Outstanding tire valve



AIR CONTROL Since 1844

Schrader's famous tire valve operating principle
is the ace of standardization
for pneumatic tire-equipped vehicles everywhere

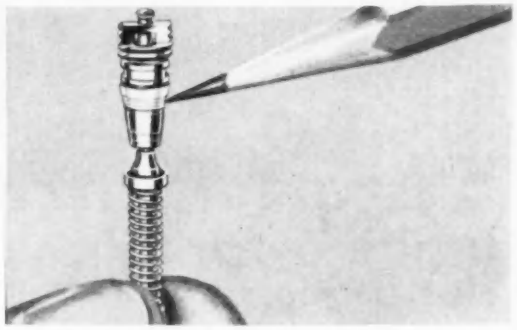
greatest enterprise—depends on tire accomplishments

performance matches tires everywhere in the world

AVAILABILITY. Schrader Tire Valves and service tools follow American vehicles to every corner of the earth, making service fast, easy, universal.

SIMPLICITY UNDERSTOOD. Schrader's system of valve interchangeability *works*, because American engineering is based on *simplicity* that speaks a universal language.

INTERCHANGEABLE. Wherever tires are serviced, stocks of Schrader replacement valves are on hand to help every tire deliver full mileage.



QUALITY FIRST. One indication of the success of Schrader's Ace of Standardization is that tire valve performance is taken for granted the world over.

There's excellent reason why the American automotive and tire markets circle the globe. No other industry in history has approached the quality and dependability of its mass-produced products. For example, only a complex of highly specialized companies, *working together*, drawing upon their combined skills, information and facilities, could have developed the modern tire and tire valve that has performed on every vehicle that has ever travelled. You can count on Schrader to produce the quality tire valves to match the performance of your present and future vehicles, wherever they travel.

Schrader®
a division of SCOVILL

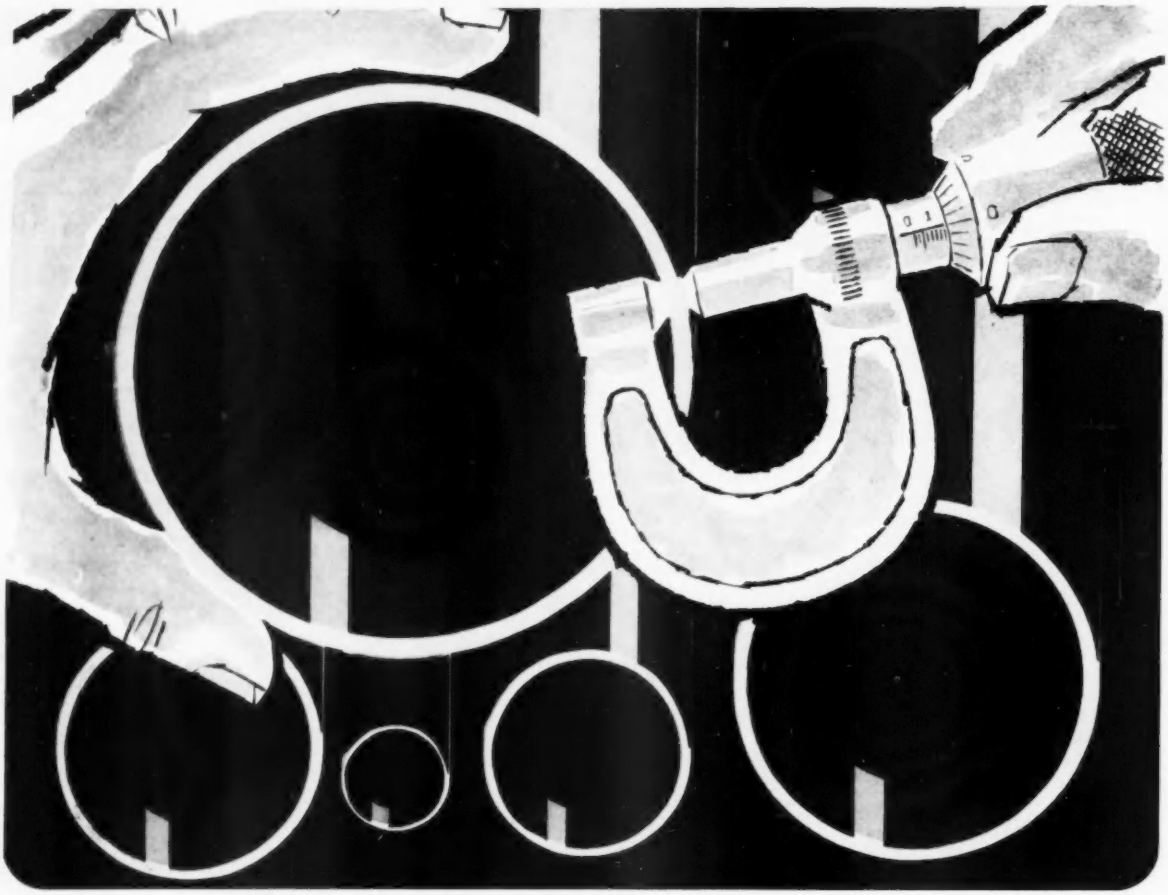
A. SCHRADER'S SON • BROOKLYN 38, N. Y.
Division of Scovill Manufacturing Company, Incorporated

FIRST NAME IN TIRE VALVES

FOR ORIGINAL EQUIPMENT AND REPLACEMENT

Circle 120 on Inquiry Card for more data

Experience *— the added alloy in* ***Allegheny Stainless***



looking for thin walls in big diameters?

A-L now offers a wide range of stainless seamless tubing with walls as thin as .013".

From what other source would you expect to get stainless seamless tubing of 3½" OD with walls as thin as .058" and in the widest range of materials anywhere to fit a broad range of requirements in new products and processes?

Allegheny Stainless Tubing ranges from 3/16" OD to 3½" OD with wall thickness from .013" to .375". Typical of the specials A-L can make are 2½" OD—.032" wall thickness, 3" OD—.042" wall thickness and 3½" OD—.058" wall thickness. All sizes with true circularity, no dents or handling marks.

Stainless seamless tubing is made in all stainless grades including 309, 317, 318, 310, 416 and 446—normally difficult to obtain. For special high-temperature applications, A-L produces tubing in high-strength alloys such as A-286, and in vacuum melted steels and alloys. Also in custom analyses such as low cobalt (.01-.05) grades and with boron additions to standard grades.

A-L also makes composite tubes with bonded combinations of carbon and stainless steels and other metals for unusual corrosion applications in process equipment.

Allegheny Ludlum Tubing is available in small orders in random or cut lengths. Standard grades in stock throughout the country.

Write for your copy of Allegheny Ludlum Stainless Tubing, or call your A-L representative for all the help you need. ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. Address Dept. AI-21.***

NEW!
FREE—A-L's new book on stainless tubing 32-pages of technical data, sizes, grades and suggested applications.

WSW 7528

ALLEGHENY LUDLUM

for warehouse delivery of Allegheny Stainless, call RYERSON

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EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT

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NEW 2-WAY
TRIGGER RELEASE
Model 462 illustrates how only one hand easily releases clamp by pressing trigger toward either handle. This patented feature available on many De-Sta-Co Portables.

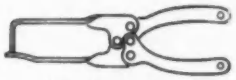
IF YOU CAN REACH IT—

A DE-STA-CO Portable Will Clamp It!

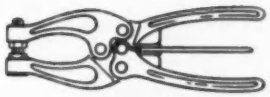
Hundreds—yes, thousands—of awkward clamping problems have been brought to us for solution in our 40 years of leadership. Many of these have been solved by De-Sta-Co Portable Clamps. You now have a selection of two dozen basic models, a variety which masters almost any conceivable portable, blind or awkward clamping operation. To add to the versatility of all our portables, there's a complete line of accessories. Features which may aid you in your next problem are

1. ***Two way trigger releases*** **on numerous models**
2. ***Deep jaws and wide spans***
3. ***Flexi-matic and Pressure-matic spindle adjustments***
4. ***Non-magnetic materials*** **for the special application**
5. ***Light weight models*** **for continuous frequent handling**

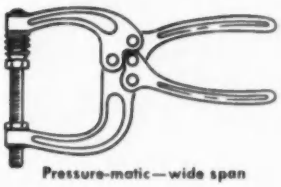
Compact models



Self-adjusting models



Deep jaw models



Pressure-matic—wide span

De-Sta-Co Portables lend themselves to special adaptations for that "insurmountable" problem.

Standard portables offer jaw openings $\frac{1}{2}''$ to $6''$, throat depths to $3\frac{1}{2}''$, pressures from 35 lb. to 1200 lb.

Send for the De-Sta-Co catalog with details on over 130 types, sizes and models of portable and *fixture* clamps. We'll send you the name of our stocking distributor in your area. He is ready and qualified to assist you with your clamping problem.

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DE-STA-CO

DETROIT STAMPING COMPANY

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NEW SPICER 1550 SERIES

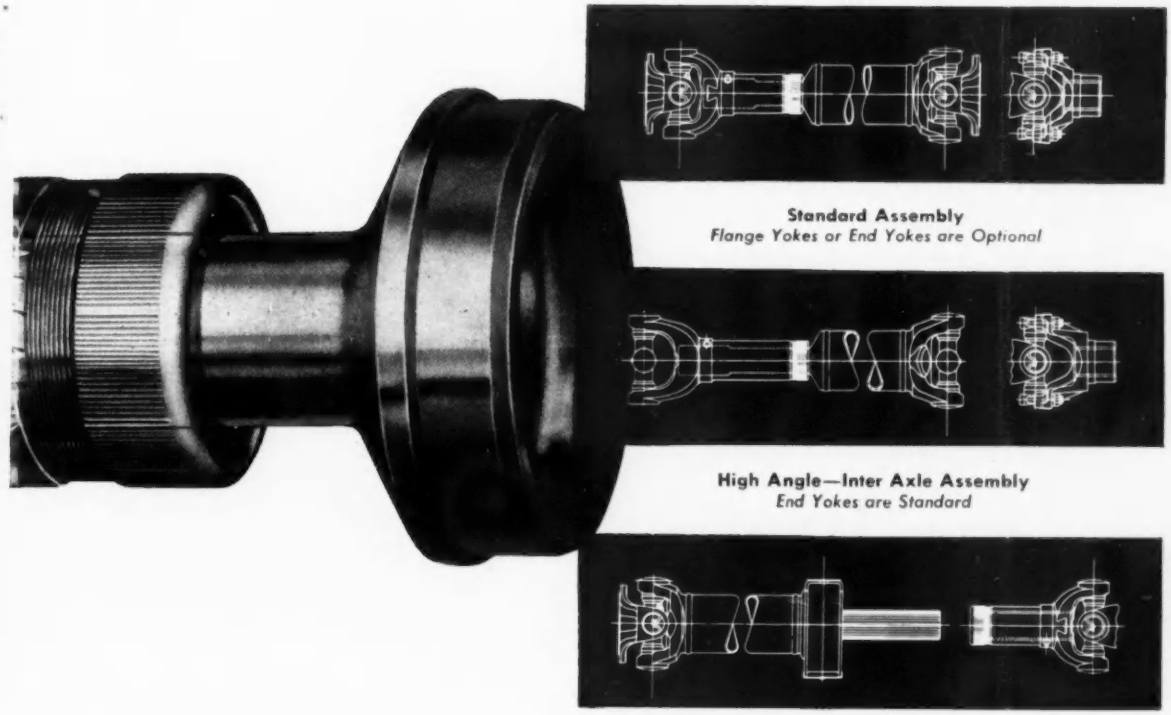
A bigger, more rugged universal joint for trucks with 29,000-30,000 GVW

Spicer is now manufacturing a completely new series of universal joint . . . the 1550 series. With 20% greater bearing factor and a minimum elastic limit 20% greater than previous 1500 series joints, the 1550 series is a bigger performance value . . . *at lower cost.*

The new 1550 series universal joints give you **these important performance advantages:**

- Reverse Spline Center Bearing construction.
- Crowned Bearing Races, for better bearing alignment, longer life.
- Shorter length flange face to flange face on short coupled sets, to take full advantage of available space.
- "U" bolt and snap ring design for reduced maintenance costs.
- Synthetic double lip type seal, for tighter, more positive sealing.
- Extremely close limits of static and dynamic balance for vibration-free operation.

UNIVERSAL JOINTS . . .



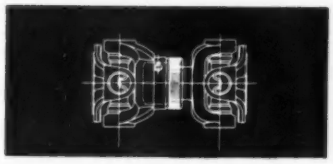
Standard Assembly
Flange Yokes or End Yokes are Optional

High Angle—Inter Axle Assembly
End Yokes are Standard

Multiple Shaft Assembly With Center Bearing

The 1550 series is now available in all present variations of the 1500 series—including short coupled, high angle and long slip propeller shafts.

For more complete details on the new 1550 series universal joints write to Dana Corporation, Toledo 1, Ohio.



Short Coupled Assembly
Flange Yokes or End Yokes are Optional

DANA Spicer

DANA CORPORATION

Toledo 1, Ohio

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Many of these products are manufactured in Canada by Hayes Steel Products Limited, Merritton, Canada

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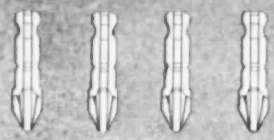
Count on *Continental* for this

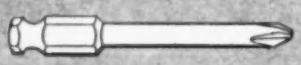
2-way saving in bit costs

HY-PRO

You get 4 HY-PRO PHILLIPS Insert Bits



for the cost of 1



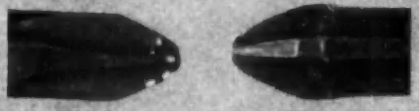
conventional bit

HY-PRO PHILLIPS Insert Bits cost only about one-fourth as much as solid bits, and there is no extra expense for re-sharpening. When a HY-PRO bit wears out, you simply replace it with a new bit . . . and restore *full* driving efficiency at negligible cost.

POWER BIT HOLDERS made in types and sizes to fit all driving tools

HY-PRO PHILLIPS Insert Bits are FORGED

Tested and proved to **outlast other bits 2 to 1**



Best comparable bit — HY-PRO Phillips Bit

Each bit drove the same number of screws

High strength *forged* HY-PRO Bits are production tested and proved to have an average service life *double* that of the best comparable bits. Many users report even greater margins of extra life for HY-PRO bits, often as high as 4 to 1.

Make your own tests— Compare bit life on your toughest driving jobs. Figure *all* costs. Continental Assembly Specialists will cooperate fully in conducting tests. You'll find HY-PRO Insert Bits and Holders your best buy for lasting bit economy.

Precision control with the same Phillips master tools assures uniformly accurate fit of HY-PRO Phillips Bits and HOLTITE Phillips Screw recesses. Use this proved combination for the top efficiency you need in assembly — especially with power and automatic driving equipment — to avoid downtime, rejects, and weak fastenings. For full information, write: Continental Screw Co., 451 Mt. Pleasant St., New Bedford, Mass.

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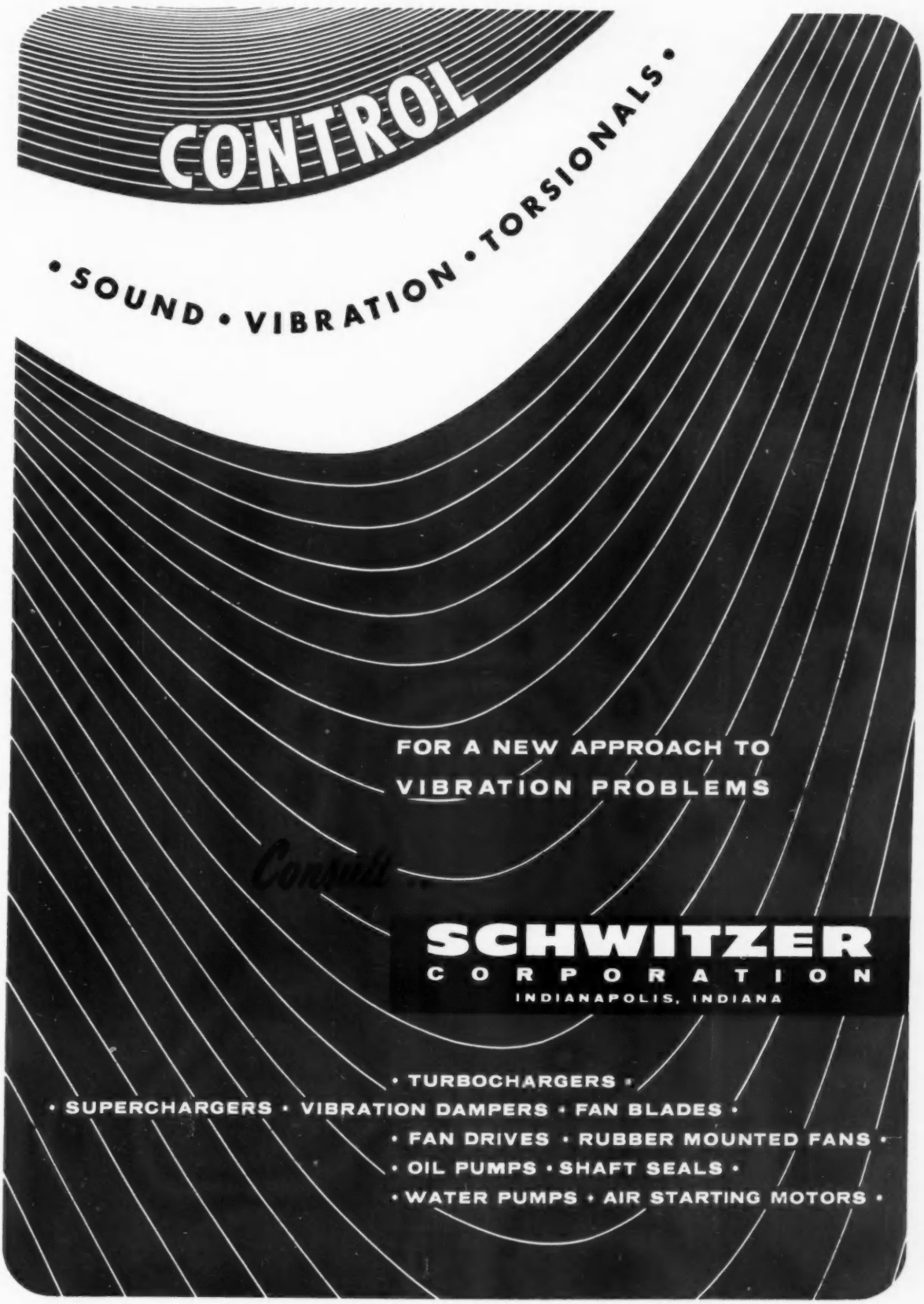
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WHY ROCHESTER-GM CARBURETORS ARE AMERICA'S NUMBER ONE ORIGINAL EQUIPMENT CARBURETORS!

MILLIONS OF RUGGED TEST MILES ASSURE CUSTOMERS OF PEAK PERFORMANCE AND ECONOMY!

New High in Carburetor Reliability!

The weather man has no surprises for your cars when they are equipped with Rochester-GM Carburetors. These advanced fuel-metering systems have already been through the most severe weather conditions, simulating any part of the country . . . in any month of the year. Rochester-GM Carburetors have trouble *tested out* . . . reliability *built in*. That's why your customers get promised performance and economy. And that's why Rochester-GM Carburetors are America's number one original equipment carburetors. Keep an eye on your customer's satisfaction . . . keep a Rochester-GM Carburetor on his car. Rochester Products Division of General Motors, Rochester, New York.

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ROCHESTER CARBURETORS

BETTER-BUILT FOR CADILLAC, BUICK, OLDSMOBILE, PONTIAC AND CHEVROLET

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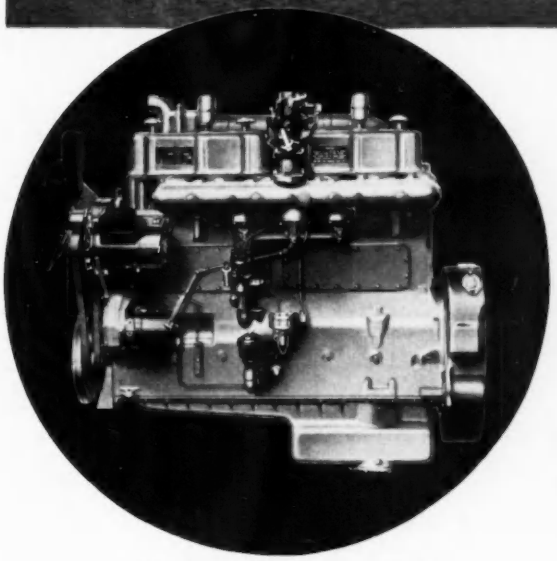
On the milk run

...OR ANY RUN

PETERBILT truck—tire size: 10:00 x 20; rear axle ratio: 5.91; gross vehicle weight: 76,800 lbs.—is powered with Waukesha 145-GZB engine.



Waukesha 145-GZB High Output Gasoline Engine, 5⅜-in. bore x 6-in. stroke, 817 cu. in. displacement, up to 260 hp at 2400 rpm.

where the pay-off is on pay-load

WAUKESHA *transport* ENGINES

Short runs or long hauls—the pay-off is on pay-load that gets there faster. A rare combination of extra power plus extra speed, with rugged reliability—the Waukesha 145-GZB High Output Engine keeps trucks on schedule with day-after-day all-ways-dependable regularity. It's a high compression, overhead valve gasoline engine with interchangeable cylinder heads, removable wet sleeve cylinders, water-heated intake manifold, vibration dampener, heavy-duty aluminum pistons, 7-bearing, 3½-inch crankshaft fully counterbalanced and many other fully-proved features, all detailed in Bulletin 1553.

WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN
New York • Tulsa • Los Angeles
Factories: Waukesha, Wisconsin and Clinton, Iowa

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Gyroscopic Suspension
by Mather about 900 B.C.

LET MATHER SOLVE YOUR SUSPENSION PROBLEMS, TOO

It doesn't take a Gyroscopic expert to detect a few flaws in this smooth ridin' rig of Ulysses, nor is anyone likely to believe that Mather rigged it as this headline infers.

We do want you to know, though, that we've had fifty years of suspension experience and that our research design and manufacturing facilities are available to you. Just call CH 3-3201, or write, and a Mather representative will see you at your convenience.

MATHER

THE MATHER SPRING COMPANY
TOLEDO, OHIO

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Quality... the best economy of all

Another product of Sunoco research . . . a fire-resistant hydraulic fluid

The flame test, above, dramatizes the effectiveness of Sun's new fire-resistant hydraulic fluid. The wick in the conventional fluid burns readily; the wick in Sun's new fluid just can't be lighted.

SUNSAFE, a water-in-oil emulsion, eliminates fire hazards . . . provides increased safety to personnel and equipment. At the same time, operators get the essential performance characteristics of a top-grade hydraulic oil—low rates of wear, long service life, and protection against rust and corrosion.

This combination of *quality* in engineering know-how, and *quality* in product, proves once again that *quality* in any sense is the best economy of all.

For 73 years Sunoco has meant quality right down the line. Today, this quality is found in more than 400 Sunoco industrial products. SUN OIL COMPANY, Phila. 3, Pa., Dept. I-14.
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Use AIRCO EASY ARCSTARTS!"

The first time you try Airco's new EASY ARCSTART Electrodes you'll never go back to scratchin' an' peckin' with yesterday's electrodes.

Welding mild or low alloy steel, or hardfacing? Airco EASY ARCSTART Electrodes enable you to *use lower amperage for starting, if desired; strike an arc the first time; and do it easier than ever before.*

The tip coating does the trick. This is the cap at the striking end of EASY ARCSTART Electrodes – a special metallic compound that instantly initiates arc current.

Airco EASY ARCSTART Electrodes are available in diameters from 1/16" to 5/32"... for mild steel, low alloy steel and some hardfacing electrodes.

For samples, write on your letterhead . . . or phone your nearby Authorized Airco Dealer. He's listed in the Yellow Pages under "Welding Equipment and Supplies".

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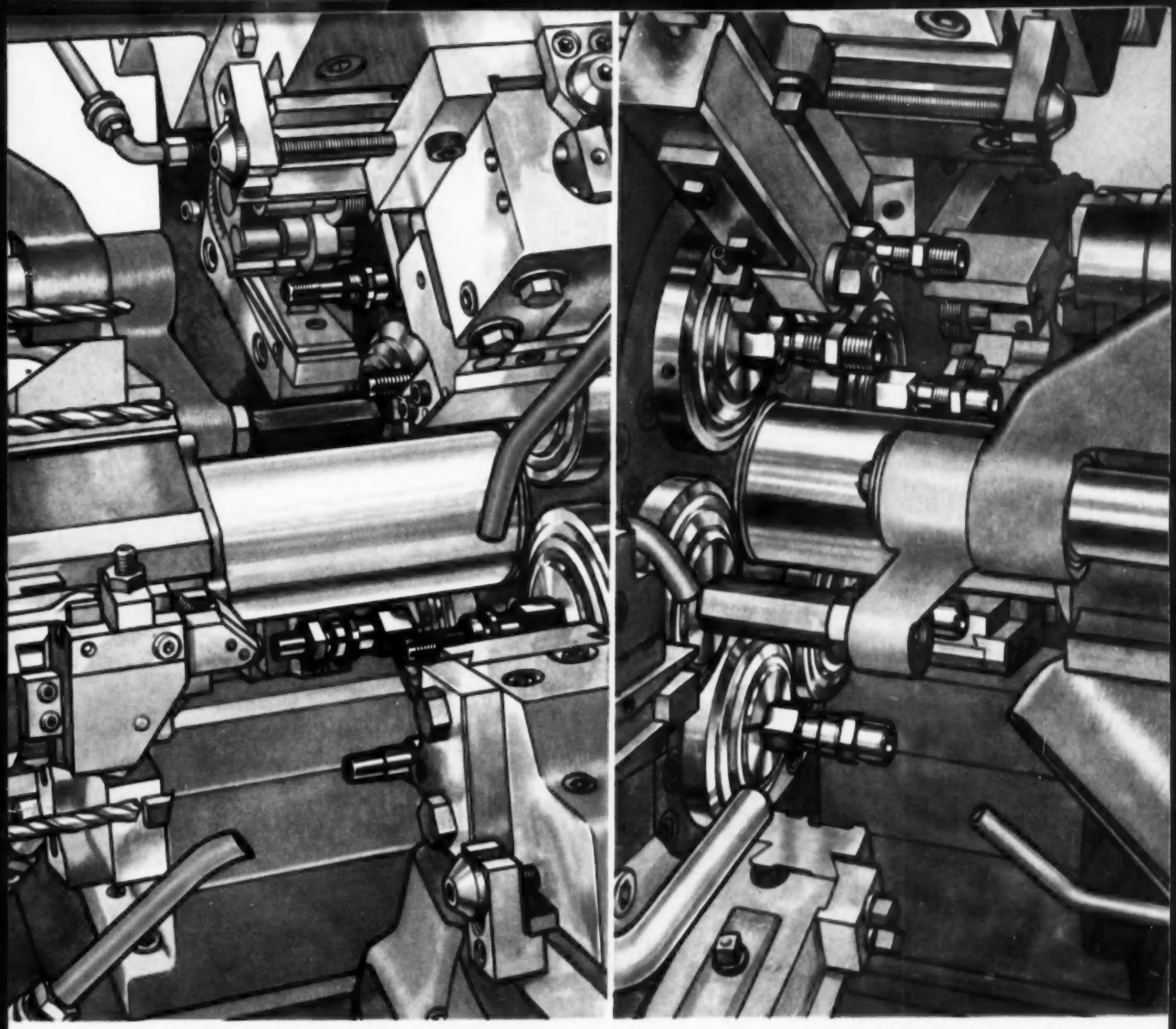
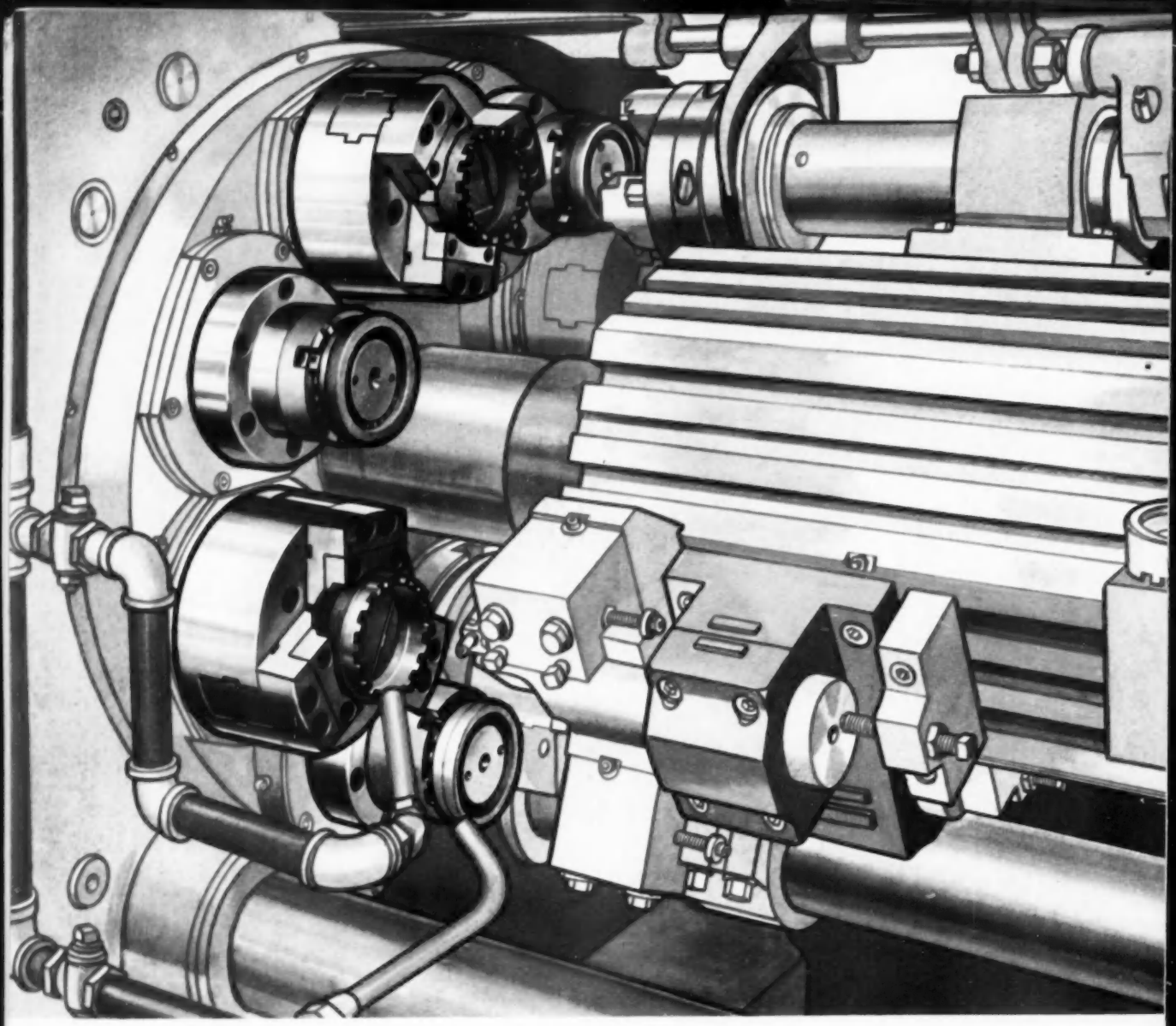


stainless, **225** *per hour—brass* **1500** *per hour.*

Up to a point increased machine productivity is a matter of refinements, additions, skillful tooling and perhaps more power. Eventually you achieve about all the efficiency that can be built into equipment of conventional design.

To achieve a major break-through in bar machine productivity necessitated redesign from the ground up. New Britain has done it with such success that we are able to offer the metalworking industry a whole new family of machines with performance unequalled anywhere. Independently cammed cross slides open up a whole new world of tooling possibilities. Power and spindle speeds are adapted to the important new metals and alloys. Increased chucking capacity allows application of New Britain standards of speed and accuracy to much larger pieces. None of the famous New Britain exclusive features which preserve accuracy and increase accessibility over other machines have been sacrificed. The chart below tells part of the story, and we have complete literature available to spell it out completely on the models which interest you particularly. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

Model	Spindles	Cross Slides	Spindle Speeds	Spindle Capacity	H.P.	Weight
45	4	4	43-526	5″	30-50	46,000
52	6	6	271-4250	1 1/4″	15-25	12,800
62	6	6	177-3000	1 5/8″	15-30	18,800
62	6	6	177-3000	2 1/4″	20-30	18,875
82	6	6	64-633	3 1/2″	30-50	46,000
83	8	6	99-1504	2 5/8″	30-50	46,000



open secret *of New Britain superiority.*

Wide-open design makes the most fundamental difference between a New Britain automatic chucking machine and other machines. It speaks for itself as a means of getting at the tooling, making adjustments and clearing chips.

Massiveness, right from the floor up, is equally apparent and equally important in chucker work. You see it in the way the cutting tools make the heaviest cuts with a chatter-free smoothness that can't be duplicated.

Only New Britain provides a combination of longitudinal with transverse forming motion where needed. This versatility eliminates the need for second operation machines in many cases —particularly when a job is setup for double indexing, as illustrated above.

New Britain spares no pains to incorporate every new development to make chucker-type machining more profitable. The open-end design lends itself particularly well to magazine loading and unloading, for example, and many New Britains are being equipped to provide this feature.

Whenever a number of operations are required on cast or forged pieces, these massive, rugged, powerful machines offer great possibilities for savings through faster, more accurate, more reliable production. A new and complete catalog on the New Britain chucker line is just off the press. We would be very glad to send you your copy. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

NEWS

Vol. 121, No. 6 September 15, 1959

Big Tooling Program Ahead

But Independents Continue to Feel Pinch of Captive Shop Competition

The largest tooling program in many a year is coming up within 30 days, but Detroit-area tool shops, traditionally the main source of supply, don't view the future optimistically.

Special tooling for calendar 1960 is expected in many quarters to equal the costly program of 1955-56, but the historically strong Detroit shops are not expecting to crowd their shops with new business. The independent job shops are feeling more and more the pinch of competition from the automobile companies themselves.

Great changes are expected in 1961 model automobiles. Great changes in models usually mean good business for the die shops a year in advance. But the problem this year is whether the "captive" shops of the automobile companies or the independent shops will get the business.

Major Model Changes

The model changes are hinged to two certainties and one possibility. The certainties involve complete new bodies for all General Motors cars, and major changes for Ford lines. The possibility is that Chrysler may move its scheduled 1962 line forward a year, so that the tooling business will come during 1960 instead of 1961.

In addition, changes at American Motors and Studebaker-Packard could add to the overall new business.

But the hard fact is that the die shop capacity of the automobile companies may well absorb all the new business coming in 1960.

One Detroit die shop operator says the biggest competition he faces is the increase in capacity at the shops of the automobile companies. He is more concerned with captive shops than he is with foreign competition, non-union shops or even the "back alley" shops that have been making inroads in recent years.

He points out that the automobile company tool shops have increased from 200-man shops a few years ago to 600-800 man shops now. As an example, he cites Ford's Chicago operation, which reportedly has increased from 200 to 600 men, and Ford's Buffalo shop which has grown from 200

HILLMAN-MINX HAS AUTOMATIC TRANSMISSION

Tail-finned Hillman Minx for 1960 is offered with a fully automatic transmission, said to be available for the first time on a volume-produced light car. Designated "Easidrive," the transmission is a development of the Smith Autoselectric (AI, Dec. 15, 1956), which incorporates electromagnetic clutches made under a licensing agreement with Eaton Mfg. Co. In this, a pair of powdered iron clutches engage the indirect ratios and direct drive through coaxial shafts on the constant-mesh, three-speed gearbox. Power of the 91-cu in. engine has been raised to 56.5 hp at 4600 rpm.

to an estimated 1000 since 1950.

Estimates from other sources are even more pessimistic. These sources will be surveyed in a later issue.

S-P Adds 2 New Models

Studebaker-Packard Corp is going after a sales increase of at least 33 per cent and a deeper market penetration of three per cent during 1960. This would mean sales of nearly 195,000 Lark passenger cars, based on predictions of total domestic sales of 6.5 million cars.

The company is pinning its hopes on two new models, expansion of the total small car market, momentum from 1959 Lark sales, an enlarged dealer organization, and engineering changes in all '60 Lark models.

The new models are a two-door convertible in the Regal series and a four-door station wagon available in both the Regal and Deluxe series. These two will bring to six the number of body styles offered by Lark in 1960. Every model will be available with either V-8 or six-cylinder engines.

The convertible is expected to sell for approximately $2600 with standard equipment. Public introduction of all models is slated for Oct. 15. Prices will not be firm much before then.

First Compact Convertible

Studebaker becomes the first producer of compact cars in this country to offer a convertible, although Rambler is expected to bring out a soft top in the spring of 1960.

The model lineup for 1960 will include the convertible, four-door wagon, four-door sedan and two-door hardtop in the Regal series, and the four-door and two-door wagons and four-door and two-door sedans in the Deluxe series.

Harold E. Churchill, president of Studebaker - Packard, said introduction of additional compact cars in the 1960 market will act to stimulate and expand the market. He, like George Romney, his opposite number at American Motors, is confident the Big Three small cars will aid his compact car sales.

Lark, introduced just a year ago, is the surprise car that pulled Studebaker back into the ranks of profit-makers. During the first half of 1958 S-P sold only 0.95 per cent of the domestic market, but with Lark, penetration this year climbed to 2.52 per cent during the same period. Meanwhile, the company reported six-months' profits of $12 million, highest in nearly a decade.

Lark sales during the first half of 1959, says Churchill, ran 250 per cent ahead of last year, and production during that period jumped 381 per cent. Total for the 1959 model run was 131,508 cars. Studebaker is counting on this one-year backlog of sales and experience to maintain a foothold in the scramble for small car sales.

Dealer Setup

Churchill, speaking at the Sept. 8 press showing of the 1960 Lark, stressed the importance of the enlarged dealer organization in the drive for three per cent of the market. Since Aug. 1, 1958, more than 1000 new dealers were added, in some cases opening new markets for Studebaker.

Most of the changes for 1960, according to Chief Engineer E. J. Hardig, are "under the hood." These include improved brakes, a new box section frame, high capacity defroster system, inside controlled hood lock, non-glare instrument board, and improved gasoline economy in both six and V-8 engines.

Engine refinements include new carburetion and modified combustion chamber design, butyl mountings, and improved all-around engine performance.

Styling changes are moderate, although new tail lights stand out. No two-tones will be available, but the convertible top, in black or light fabric, provides a contrast to light or dark body finishes.

Ford Unveils Falcon

Ford Motor Co. has taken the wraps off the all-new Falcon, inaugurating a new era in basic transportation.

First of the Big Three entries in the compact car field to be unveiled, the new Falcon is heralded as a "revolutionary breakthrough" in automotive design, similar to the ones achieved by the Model T, Model A, and the first popularly priced V-8.

Speaking at a 21-city closed cir-

GERMAN BUS HAS FRONT-WHEEL DRIVE

Eight-passenger Rapid bus, made by Tempo Werk, Hamburg, Germany, uses front-wheel drive for an unobstructed floor area. The 58-cu in. engine, a standard British Motor Corp. unit, develops 32 bhp at 4100 rpm. Front suspension is by a transverse leaf spring, while coils support the rear swing axles. Rear luggage compartment provides 24-cu ft of cargo space below the window level. Built on a 94½-in. wheelbase, the bus is 173 in. long and 68 in. wide.

cuit TV press conference earlier this month, Henry Ford II, president, said the Falcon is three-quarters of a ton lighter than the Ford Fairlane, yet has the roominess of a standard car—as well as a big-car feel. The new model, with a curb weight of 2366 lb, is capable of getting 30 mpg in normal highway use, he stated.

Mr. Ford cited estimates of 750,000 to 1,000,000 for sales of the Big Three economy cars during calendar year 1960. "Of these," he declared, "a substantial number should be additional sales that the market would not otherwise have generated." Economy cars, he added, will also accelerate the increase of multiple-car families.

Simplicity Featured

Ford engineers say the Falcon's simplicity of design is illustrated by the fact that the body contains 200 fewer parts than the standard Ford car body—and the engine 120 fewer parts than the standard six-cylinder engine. Ford developed for the Falcon a door assembly with 31 fewer parts. Six pounds was saved by making the top of the gas tank serve as the floor of the luggage compartment.

Other features include use of a single-barrel downdraft carburetor with manual choke, and a hood prop instead of conventional sprung mountings. Grille for the defroster outlets and radio is combined in one piece.

The Falcon's body is of unitized construction. To meet the problem of rusting, Ford scientists developed a zinc-plated steel that not only resists corrosion but also takes a weld. This specially-processed steel is used in rocker panels and other body sections particularly susceptible to rusting. Fenders are bolted-on for ease of replacement.

The Falcon's windshield is one-piece curved, but not full wraparound. Seats are of tubular construction, eliminating the need for seat side shields. Foam polyurethane is used in front seat cushions for added comfort.

VAUXHALL CRESTA GETS FACELIFT

GM's British-built Vauxhall Cresta has its face lifted for 1960. Styling changes include a restyled front end and one-piece wraparound rear glass. Mechanical features include additional stiffening of the integral body rear-end, and a larger radiator with shrouded fan. The heater is now thermostatically controlled. The Cresta has a 105-in. wheelbase and is powered by a 138-cu in. engine developing 82.5 bhp at 4400 rpm.

Engine Is Lighter

The 144-cu-in. engine, which weighs 345.5 lb, has a bore of 3.5 in. and a stroke of 2.5 in.—giving it an unusually-high bore-to-stroke ratio. Its weight is said to be 190 lb less than that of the last Ford engine offered with the same 90-hp rating. An interesting design feature is that the intake manifold is cast integral with the cylinder head.

The Falcon engine, of the water-cooled type, has a cast iron cylinder block and head, but employs aluminum in the flywheel housing, pistons, oil pump, and other small parts. The transmission extension is also of aluminum, as is likewise the housing of the optional two-speed automatic transmission.

The Falcon will initially be offered in two-door and four-door sedan models. A station wagon and a small pickup called "Ranchito" will be brought out later in the model year.

Other Features

Ford's safety steering wheel and safety door locks are standard equipment. Other features of the Falcon are 13-in. wheels (tires are "low profile" type and 6.00 x 13), a 12-v electrical system, parallel-operated windshield wipers, and a luggage compartment with 24.5 cu ft of space.

Optional equipment includes heater, radio, automatic transmission, safety padding, seat belts, tinted glass, and deluxe trim. Power steering, power brakes, and other powered accessories are not being offered.

Ford verified that the Falcon will be assembled in Lorain, O., San Jose, Calif., and Kansas City, Mo. Two-shift operations at Lorain and Kansas City will be devoted solely to Falcon production. Engines will be made at Ford's Lima, O., plant.

The new car goes on sale at Ford's dealers October 8, when its base selling price (rumored to be just under $2000) will be revealed.

NEWS

CONTINUED

Chevrolet Goal: 1.8 Million Cars in '60

Aided by sales of 300,000 Corvairs, Chevrolet optimistically looks forward to a record-breaking year with 1.8 million passenger cars in 1960.

Division general manager Ed Cole revealed his goals for the coming year, along with a few details on the Corvair, at the press unveiling Sept. 10 of the revolutionary new Corvair.

Not Just A New Car

The small car, on a 108-in. wheelbase, indeed is revolutionary. More than just a new car, somewhat smaller than standard, the Corvair introduces a new air-cooled, six cylinder horizontally opposed rear-mounted engine. This feature alone sets the Corvair apart from anything now in production in the U. S.

Cole says the car will weigh 2375 lb, or 1385 lb lighter than a comparable 1959 Biscayne model. Overall length is 180 in.; height, 51 in.; and width, 66.9 in. As reported earlier in AI, Corvair will be available in a four-door sedan only, but with standard and deluxe treatment. A two-door sports coupe will be offered after Jan. 1.

Healthy Stimulus

Cole says the three new small cars (Corvair, Falcon, Valiant) will give a healthy stimulus to the 1960 automobile market, which will total at least 6.9 million cars and 1.1 million trucks. He hopes Chevrolet can sell 1.5 million standard size cars, 300,000 Corvairs and 365,000 trucks. Previous record production was 2,066,337 cars and trucks in 1955.

Corvair will make its official public debut Oct. 2. Cole expects advance orders for the new car will reach 50,000 by Oct. 5. Production began July 6 at Willow Run, Mich., and followed later in Kansas City and Oakland, Calif. Standard passenger car production began Sept. 14 at all Chevrolet assembly plants.

Price Range

Corvair prices, Cole announced, will range from $1810 for the two-door coupe in the 500 series to $1920 for the four-door sedan in the 700 series. The two-door coupe will not be available, however, until January 1.

CORVAIR PRICES*

500 Series—2-door coupe—$1810
4-door sedan— 1860

700 Series—2-door coupe—$1870
4-door sedan— 1920

* Suggested factory list price, exclusive of Federal, state, and local taxes, and delivery and handling charges.

V-8 Engine Redesigned

The regular passenger car line for 1960, incidentally, will offer a redesigned 283-cu in. V-8 engine which will give fuel economy "approaching that of the six." New tires, with treads using a petroleum rubber derivative called styrene butadiene, reduce cornering squeal and increase tread life, according to Cole.

Cole traced the development of Corvair from its first basic designs in 1950. By Spring of '56, he said, the rear-engine, rear-drive was agreed on as the most advantageous for a compact car.

Corvair Firsts

The Corvair represents more than 1.5 million man hours of engineering and development work. Experimental units have logged more than two million test miles.

Cole claims four major firsts for the Corvair: First modern rear-engine car, first lightweight, air-cooled engine, first transaxle with independent suspension, and special tire-wheel development for better handling and stability.

Cole calls his car the "prestige car of the compact car market," predicting it will be the "most wanted" car in its field.

New High for Stainless

The automotive industry bought 169 per cent more stainless steel in the first half of 1959 than in the like period a year ago, American Iron and Steel Institute reported.

First-half shipments totaled 63,923 tons, compared with 23,771 tons for the first six months of 1958, the Institute said.

The AISI attributed the increase to the strong business recovery from the recession and to a 15 per cent rise in the amount of stainless steel used per car.

GM Promotes Goad

General Motors directors have named Louis C. Goad executive vice-president in charge of all general staff activities of the corporation. The move, in effect, makes Goad No. 3 man behind president John Gordon and board chairman Frederick G. Donner.

Goad had been executive vice-president in charge of automotive, body and assembly, and parts divisions. This post has been filled by Sherrod E. Skinner, who is now an executive vice-president.

The board elected two new executive vice-presidents, making a total of four. In addition to Skinner, the other new executive vice-president is Cyrus R. Osborn, who now has jurisdiction over the engine divisions, the Dayton, Household Appliance, and Electro-Motive Group, and Overseas and Canadian Group.

The fourth executive vice-president is George Russell, finance head since August, 1958.

Goad's new duties encompass distribution, engineering, manufacturing, personnel, process development, public relations, research and styling. These department heads formerly reported directly to the president and board chairman.

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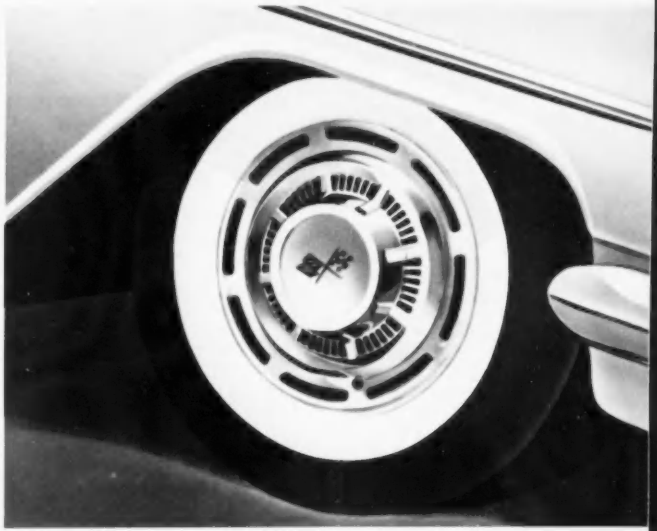

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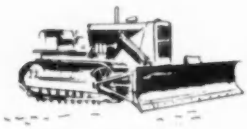
The wheel covers illustrated were fabricated by Brown-Lipe-Chapin Division, General Motors Corporation, Syracuse, New York.



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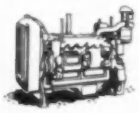

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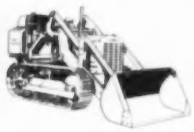

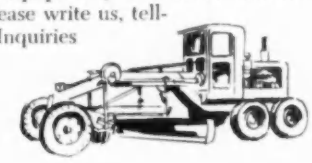

(Below – New Caterpillar Technical Center presently under construction)

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NEWS

FEATURES

Small Car Schedules

The Big Three will build about 181,000 small cars by the end of December, according to present schedules. Some 32,000 units are planned for Valiant, 49,000 for Falcon, and 100,000 for Corvair.

Corvair, first to get into production, built about 10,000 during July and August. Schedules call for 10,000-12,000 during September, 25,000 in October, and 28,000 in November and December.

Falcon had scheduled about 1300 for September, 10,000 for October, 12,500 for November and about 25,000 in December. Valiant, last of the three to get into full production, plans to build about 2000 units in October, 11,000-12,000 in November and 18,000-20,000 in December.

Corvair started out at the converted Willow Run, Mich., assembly plant, later will phase in assembly at Oakland, Calif., and Kansas City. Falcon was started at Lorain, O., but as production picks up assembly will be done at San Jose, Calif., and Kansas City.

Valiant production is just getting under way on a small scale in Hamtramck, Mich. Chrysler says any plant in the country except the Imperial plant could be used for Valiant production, if needed. Extra capacity, however, probably will come from the new St. Louis plant.

GUILIETTA SPYDER STYLED BY PININ FARINA

Latest Guilietta Spyder, built by Alfa Romeo, has Pinin Farina styling and is available as a softtop or hardtop. It is powered by a four-cylinder engine that develops 80 hp at 6000 rpm with the standard two-barrel carburetor. The same engine fitted with two 2-barreled carburetors has an output of 90 hp at 6000 rpm. Car is built on an 85.8-in. wheelbase, has an overall length of 150 in., width of 61 in.

Truck Sales Rise

Truck sales during 1960 should total about 1,075,000 units, up nearly 100,000 over the current year, a Chevrolet official estimates. Herman P. Sattler, head of truck sales for Chevrolet, says an upswing in sales began in March of this year and should carry into 1960. The expected total of 970,000 for 1959 is about 34 per cent higher than 1958.

In previewing Chevrolet's 1960 truck line (see page 62 for complete line story), Sattler told the press that one factor contributing to optimism is the average age of trucks in use today. This indicates a demand is building up for 1960 and future years, he said.

Of the truck population of 10,305,000, nearly 20 per cent are 10 years or more in age, the highest percentage since 1953. But more important, according to Sattler, is the fact that only about 42.7 per cent are less than five years old—the smallest percentage since 1948.

Sattler said these figures show that truck buying has been deferred in recent years.

Chevrolet's truck line for 1960, with new design and ride features, is expected to contribute to the increase in sales, Sattler said, although he did not predict what Chevrolet's share will be in 1960.

A1 TABLOID

A new technique for explosive forming converts electrical energy into mechanical work without using a conventional motor. Developed by Republic Aviation Corp. engineers is a new device that stores up electrical energy and then discharges it in 40 millionths of a second into a tank of water. The discharge creates a 6000-hp shock wave which hits the metal and works it into the desired shape.

* * *

Freon gas sprayed into a tiny electronic eye increases the sensitivity of homing devices used in missile and rocket guidance systems, says Du Pont Co. A simple capillary tube jets a controlled amount of Freon into the sensing unit to hold its temperature to as low as minus 114F, increasing its spectral response. Freon gases with different boiling points can be used to adjust the sensitivity of the electronic eye to the desired levels.

* * *

A new series of zinc alloys has superior resistance to creep and grain growth and a substantially lower coefficient of linear expansion than other zinc alloys in sheet or strip form, claims New Jersey Zinc Co. A typical alloy, for example, containing 0.8 per cent copper, 0.15 per cent titanium, and the balance pure zinc can be rolled so that it will have a creep rate of more than 5000 days per 1 per cent elongation under a load of 10,000 psi at 25 C.

* * *

A new chemical compound for fighting liquid fuel and electrical fires is said to be twice as effective as any other extinguishing agent. Developed by Army Engineer Research and Development Laboratories, the new agent (monobromotrifluoromethane) can also be used to prevent fires in danger areas by mixing it with helium or nitrogen to create a combustion-free atmosphere.

Taylor Fibre Co. has launched an intensified research program to open up new applications for vulcanized fibre and laminated plastics at its new research center near Norristown, Pa. The new facility includes an electric furnace specially built to fit over a Taylor tensile testing machine to allow testing of laminated plastics at temperatures up to 1000 F.

* * *

A fuel cell that works from pure hydrogen and oxygen has been used in England to operate a lift truck, a circular saw, and a welding machine. The cell, which is 30 in. long and 15 in. wide and has an output of about 7 hp, uses porous nickel electrodes with a strong solution of caustic potash as the electrolyte.

* * *

Fairchild Engine and Airplane Corp. granted a license to Canadian Steel Improvement Co. of Toronto to make A1-Fin brake drums for all Buick automobiles built in Canada. The A1-Fin process used in the bi-metallic drums completely bonds a cast iron liner to an aluminum outer drum. In the past, A1-Fin brakes for Canadian Buicks were made in Indiana.

* * *

An improved engine speed governor that has an accuracy of within one-half of 1 per cent of speed settings is expected to have wide commercial use, says AC Spark Plug Div. of General Motors. The new device, called Speed Monitor, is a compact flyball type governor that weighs only one pound and is said to be adaptable for all types of heavy machinery, Diesel engines, and aircraft.

* * *

Beryllium Corp. has added 12,000 sq ft of plant space to its beryllium metal fabrication facility at Hazleton, Pa. as part of an expansion program to meet the growing demand for beryllium components from aircraft, missile and nuclear users.

70 Million Motor Vehicles Set Record

Motor vehicle registrations in the United States rose 3.1 per cent and hit a record high of 70,416,000 at the beginning of 1959, the Dept. of Commerce estimated.

Passenger cars registrations for 1959 were estimated at 58,591,000, also a new high and up 3 per cent over 1958. Truck and bus registrations totaled 11,825,000, a gain of 3.5 per cent.

California continued in first place among states with 7.3 million total registrations and New York was second with 4.9 million.

World Motor Vehicle Output Down in 1958

World production of motor vehicles in 1958 dropped to 11,724,651 units from 12,849,463 units the previous year, the U. S. Dept. of Commerce reported.

The drop was attributed to the decrease in U. S. production, which normally accounts for 60 per cent or more of the passenger car total.

A breakdown of world figures shows: 9,157,468 passenger cars; 2,523,194 trucks; and 43,989 buses. This compared with 10,095,106 passenger cars; 2,730,933 trucks; and 23,424 buses in 1957.

U. S. passenger car production was down from 6,113,344 in 1957 to 4,257,812 last year; trucks went from 1,103,343 to 874,255; and buses from 3833 to 3039.

West Germany continued to lead foreign passenger car makers with 1,306,854 units compared with 1,040,188 in 1957. The United Kingdom was in second place, up from 865,000 to 1,051,551; and Italy was third with 369,009 passenger cars in 1958, up from 325,488 the previous year.

The Russians built 122,400 passenger cars against 90,000 in 1957, and again topped foreign truck producers with 389,000—a slight drop from 1957.

Rover Trims Line

Rover has trimmed its passenger car line by replacing the 60, 75, 90, and 105 models with the new 80 and 100.

Although body and most mechanical specifications are unchanged, two new engines have been introduced. The smaller, a 139.5-cu in. four-cylinder unit, develops 77 bhp at 4250 rpm and is similar to the latest Land Rover power plant.

The larger engine has six cylinders and is a short stroke version of the Rover 3-Litre. With a 3.063-in. bore and 4.134-in. stroke, it displaces 160.3-cu in. and puts out a maximum of 115 bhp at 4500 rpm. Design features include a 7-bearing crankshaft, roller-type tappets, and overhead inlet and side exhaust valves.

Both cars have servo-assisted Girling disk brakes in front and are fitted with Laycock de Normanville overdrive as standard equipment.

Chesebrough Pegs Market

The key to the 1960 automobile market is held by the "man of discretion" in the $7500-and-over income group, says Harry E. Chesebrough, general manager of Chrysler's new Plymouth-De Soto-Valiant Div.

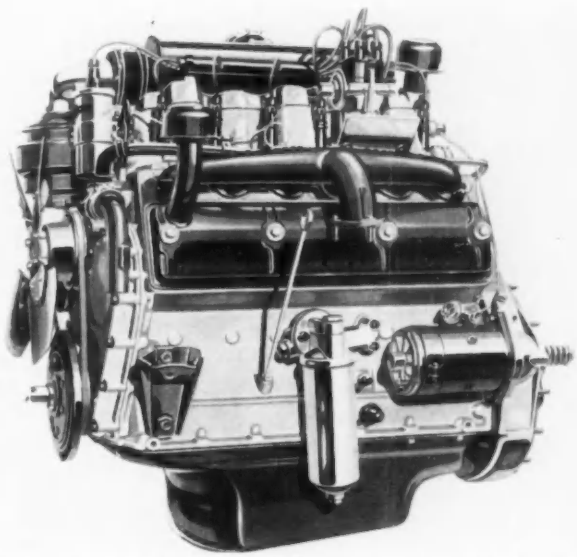
Chesebrough says the competition for this man's dollars during 1960 will be fierce not only from the automobile industry, but also from the makers of boats, hi-fi equipment, aircraft and other "exotic" products.

Chesebrough believes 1960 could well be the industry's second best year with the consumer having his choice of the largest array of automobiles ever offered. His division, he says, will have products to satisfy the desires of 96 per cent of the American automobile buying public.

Chesebrough made his predictions at a national dealer meeting in French Lick, Ind.

Also at the French Lick Meeting, Chrysler and Imperial Div. general manager C. E. Briggs forecast that introduction of the Valiant and other American compact cars will serve as a stimulant to medium and high price sales.

One reason for this, Briggs explained, is that people are showing a new interest in engineering features and construction details. He believes this will work to the advantage of the medium and higher priced cars, as well as of the smaller ones.



New Rover engine is a short-stroke version of the 3-Litre unit

Turbo-Titan II

Chevrolet is road-testing a new experimental truck equipped with the General Motors GT-305 regenerative gas turbine engine. The truck, called Turbo-Titan II, is a heavy-duty tandem axle tractor chassis.

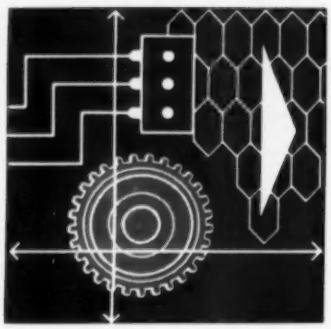
Turbo-Titan II is the second vehicle of its type tested in a cooperative project involving Chevrolet, GM Research Laboratories, and Allison Div. The first Turbo-Titan, completed two years ago, has undergone some 13,000 miles of road and durability testing.

The newer GT-305 Whirlfire engine is 350-lb lighter, 25.2-in. shorter, and 12.5 per cent more powerful than the engine used in the first Turbo-Titan experimental unit. Fuel consumption, however, is 25 per cent less.

Chevrolet chief engineer, Harry F. Barr, says the level of performance attained in the latest design is a "giant stride in vehicular gas turbine development."

The unit is the seventh experimental vehicle built in GM's corporate program. Previous designs included the Firebirds I, II and III, the Turbo-cruiser bus, the M-56 tank, and the first of the two Turbo-Titan trucks.

William A. Turunen, head of the Research Laboratories Engineering Development Dept., says the GT-305 is designed to achieve specific fuel consumption of 0.55 lb per horsepower hour. Further improvements in components, he says, may bring a consumption of less than 0.4 lb per horsepower hour.



AVIATION MANUFACTURING

GE Develops New Heat Shield Material

General Electric Co. announced it has developed a new organic plastic material that can withstand temperatures as high as 15,000 F.

The new substance, designed for use as a heat shield for nose cones, was discovered by the GE Missile and Space Vehicle Dept. in Philadelphia, Pa.

Dr. Leo Steg, manager of the department, said space shields of the new material can be fabricated for a fraction of the cost of protective coatings now in use—and in a fraction of the time.

In GE's simplified process, the basic materials are blended and heated in temperature-controlled ovens, mixed to the proper consistency, subjected to an air removal process, and poured into molds. The final product can be made elastic, flexible, or hard and still retain its heat-protective qualities, Dr. Steg said.

The new material was developed by General Electric under contract to the Ballistics Missile Div. of the Air Force.

Aerojet Gets Award

Aerojet-General Corp. has received a $4.9 million contract from the Army to develop surveillance drone systems.

The contract will be carried out by Aerojet's Aeronautics Div. at the Downey, Calif., plant recently bought from Rheem Mfg. Co. The award is in addition to a $2 million contract received by Aerojet in July for drone development.

New nose cone protective material developed by General Electric is shown here being tested at 15,000 F, some 4000 F hotter than the surface of the sun. The terrific heat is generated by a carbon arc encased in a water swirl. Scientist operating the mechanism is protected by darkened glass.

Cessna 210 Features Retractable Gear

Cessna Aircraft Co. has revealed design and performance details of its new Model 210, a four-place, all-metal, single-engine airplane with fully retractable landing gear.

The new model, certificated by the FAA at a gross weight of 2500 lb, has a top speed of 199 mph and a cruising speed of 190 mph at 75 per cent power at 7000 ft.

The landing gear, Cessna says, is basically the same chrome vanadium spring steel gear used on other models since 1946. The nose wheel, hydraulically operated, retracts forward and is stored vertically in a sealed compartment under the engine.

The main gear retracts aft along the centerline of the fuselage and is housed in the belly, aft of the cabin section. It operates through a rack and pinion gear. Wheel well doors close and lock hydraulically when the landing gear is either up or down.

Gear safety features include: a handpump with 125 per cent reserve fluid for use in case the engine-driven hydraulic pump fails; a safety switch to prevent gear retraction while the aircraft is on ground; separate gear up and down locks, and fail-safe solenoid valves.

The pilot's hydraulic controls for gear, flaps, and manual emergency are on a console below the center of the instrument panel.

The Model 210 is powered by a six-cylinder Continental 10-470-E engine rated at 260 hp at 2625 rpm. Price is $22,450 for the airplane with standard equipment.

Research Spending

Industry spent $7.2 billion for research and development in 1957, according to a preliminary report by the National Science Foundation. This was a gain of about 20 per cent over the $6 billion spent in 1956.

Of this total, the report said, slightly more than half was spent by aircraft and parts makers, and the electrical equipment industry. The report also pointed out that the Federal Government financed about half of the research work done by industry, for a total of $3.7 billion. The aircraft and parts industry got almost three-fifths of this sum.

Funds for basic research by industry totaled $241 million in 1957, or three per cent of the total outlay for R&D. More than 60 per cent of this amount was spent by four industries: aircraft and parts, electrical equipment, petroleum refining and extraction, and industrial chemicals.

New Plastic Bubble

Goodyear Aircraft Corp. says it has developed a new plastic bubble for supersonic aircraft that can withstand temperatures up to 400 F and won't burst under impact from a .45 calibre bullet.

The bubble is made of a plastic laminate called Thermoshield that provides the needed heat resistance and high structural strength without sacrificing visibility.

Key to the laminate is a new interlayer, designated F-3, with these properties: it is easily castable and cures at temperatures below 220 F; sticks to glass, polyester, and acrylic materials; and is highly craze-resistant.

Goodyear says it is studying the possible use of the new F-3 interlayer in laminated safety glass applications.

Hypersonic Wind Tunnel

Cornell Aeronautical Laboratory has received a $3.1 million Air Force contract to build and operate a wind tunnel for testing hypersonic missiles and space vehicles.

The new facility, said to be the first of its kind for long-duration testing, will be constructed over the next two years at CAL's Buffalo, N. Y., research center.

The wind tunnel will be capable of developing air flows of 10,000 mph and temperatures of 9000 F, for as long as 15 seconds. Present tunnels producing hypersonic air flows and temperatures can be operated for only a few thousandths of a second, CAL officials said.

Core of the new tunnel will be a wave superheater, developed by CAL under Air Force contract several years ago.

Rotary Wing Aircraft

Plans to produce a new low-cost rotary wing aircraft at the Fairchild Engine and Airplane Corp., Hagerstown, Md., plant were announced recently.

Raymond E. Umbaugh, president of Umbaugh Aircraft Corp., developers of the craft, said a subcontract has been signed with Fairchild to manufacture the Umbaugh-18 rotary wing plane. The craft will carry two people and is expected to sell for $9995.

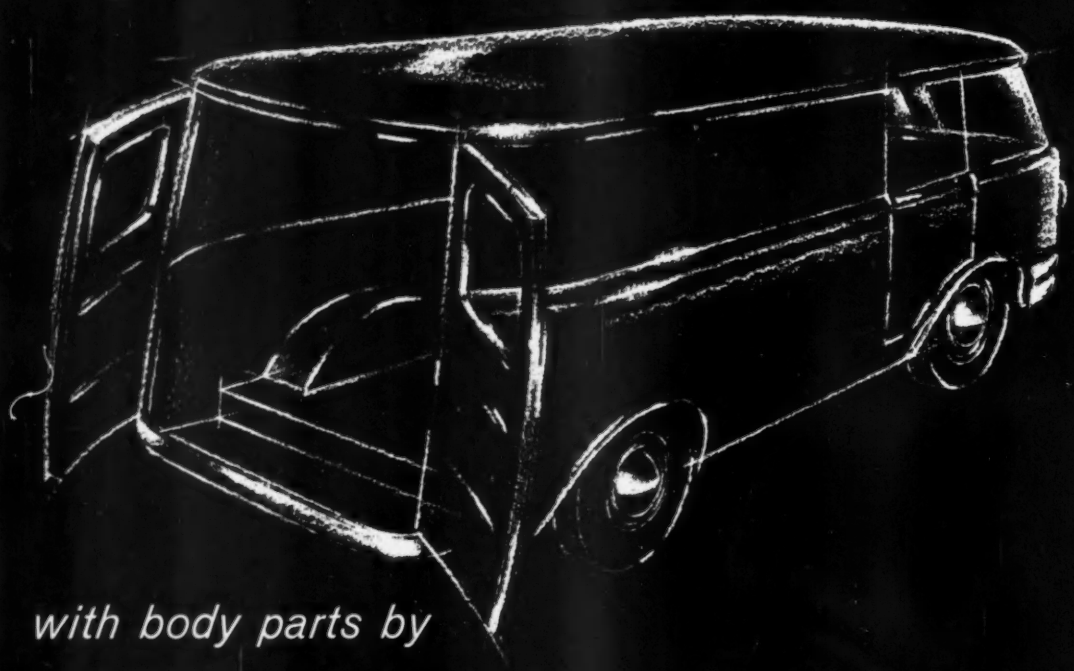
The Umbaugh-18 is propelled forward by a Lycoming 180-hp piston engine using a conventional propeller. Lift is provided by an overhead rotor, which isn't powered by the engine during flight, but receives its energy from the craft's forward or downward motion.

For vertical takeoff, the engine is geared into the rotor and disengaged just before the aircraft actually leaves the ground.

TWIN-BONANZA HAS STANDBY ROCKET POWER

Standby rocket power is now available as optional equipment on Beechcraft's Twin-Bonanza series. The two solid fuel engines, built by Aerojet General, weigh 42 lb each and develop a total of 500 lb thrust. The JATO units add 200 hp to the plane's Lycoming engines, and boost normal climb rates by 550 fpm on takeoff and 1190 fpm at 65 per cent cruise power, according to Beechcraft. Units, recently approved by FAA, are mounted on the wing within the rear engine nacelle fairing.

LEAD THE TREND TO LIGHTER TRUCKS



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MEN IN THE NEWS

Chrysler Corp.—**W. R. Donnelly** has become treasurer of Chrysler International, S.A.

American Motors Corp.—**S. O. Wahamaki** has been appointed chief design engineer; **F. R. Kishline,** staff technical engineer; **T. M. Lawler, Jr.,** assistant development engineer; and **S. V. Puidokas,** chief project engineer.

Hercules Motors Corp.—**J. G. Rongitsch** has been named assistant to the director of manufacturing and **K. D. Evans** manager of quality control.

Baldwin - Lima - Hamilton Corp., Loewy-Hydropress Div.—**P. G. Mayer** is now general sales manager.

Bendix Aviation Corp.—**J. C. Gorham** was made Midwest regional manager for the Industrial Controls Section.

Chicago Pneumatic Tool Co.—**C. L. Lane** has become manager of plant operations.

General Motors Corp., Packard Electric Div.—**J. R. Lakin** was named general sales manager and **L. C. Wolcott** director of engineering.

Eaton Mfg. Co.—**E. R. Griffith** and **R. A. Snyder** were promoted to service manager and assistant service manager, respectively, of the Axle Div., and **R. J. Rooke** was promoted to factory manager of the Stamping Div.

Kaiser Industries Corp.—**J. F. McCloud** was elected president of Industrias Kaiser Argentina, S.A.

Sheffield Corp.—**C. T. Thompson** was named vice-president and general manager.

U. S. Rubber Co.—**C. H. Baldwin** has been appointed general sales manager of manufacturer's products in the footwear and general products division.

Allis-Chalmers Mfg. Co. — **R. E. Goodwill, Jr.,** was named manager, general product division sales, Central region, and **W. R. Carlyon,** general industrial sales, Detroit district.

Lockheed Aircraft Corp. — **L. E. Root** has become group vice-president, missiles and electronics; **A. C. Kotchian,** group vice-president, aircraft; **H. J. Brown,** vice-president and general manager of Missiles and Space Div.; and **W. A. Pulver,** vice-president and general manager of Georgia Div.

Associated Spring Corp.—**J. B. Barr** was named sales manager of the Ohio Div.

Republic Gear Co.—**M. W. Thimmel** is now general sales manager.

Crucible Steel Co., Spring Div. — W. R. Mogg has been appointed general manager.

Electric Auto - Lite Co.—R. J. Nufer was named special Detroit representative for automotive ignition systems and other original equipment components.

Ohio Rubber Co.—M. J. Marsh has become president, succeeding H. F. Safford, retired.

National Screw & Mfg. Co.—F. J. Stuart was made production manager.

Wyman-Gordon Co.—L. K. Hutchinson was promoted to works manager of the Worcester plant.

Timken Roller Bearing Co.—D. A. Bessmer was elected president and H. E. Markley succeeds him as executive vice-president.

U. S. Steel Corp.—**J. Pugsley** and **W. A. Walker** were elected executive vice-president, accounting, and administrative vice-president and comptroller, respectively; and **J. B. Guba** was named sales manager, Detroit district sales office.

Electric Auto-Lite Co. — **R. D. Thomas** was made project engineer in the Spark Plug Laboratory.

Scovill Mfg. Co.—**J. J. Hoben** was elected vice-president and operations manager.

Syntron Co.—**B. K. Hartman** has been appointed executive vice-president and general manager.

Controls Co. of America—**H. B. Wilgus** has been named general sales manager, appliance and automotive controls sales.

Firestone Tire & Rubber Co.—**G. D. Hitler** has been given a special sales assignment and **C. H. Hahn** succeeds him as manager of dealer sales.

Bendix Aviation Corp., Filter Div.—**F. H. Huntoon** was named factory manager.

Dow Corning Corp.—**M. H. Leavenworth** was named manager of the Cleveland sales office, succeeding **W. W. Pedersen,** who was transferred to the main office, Midland, Mich.

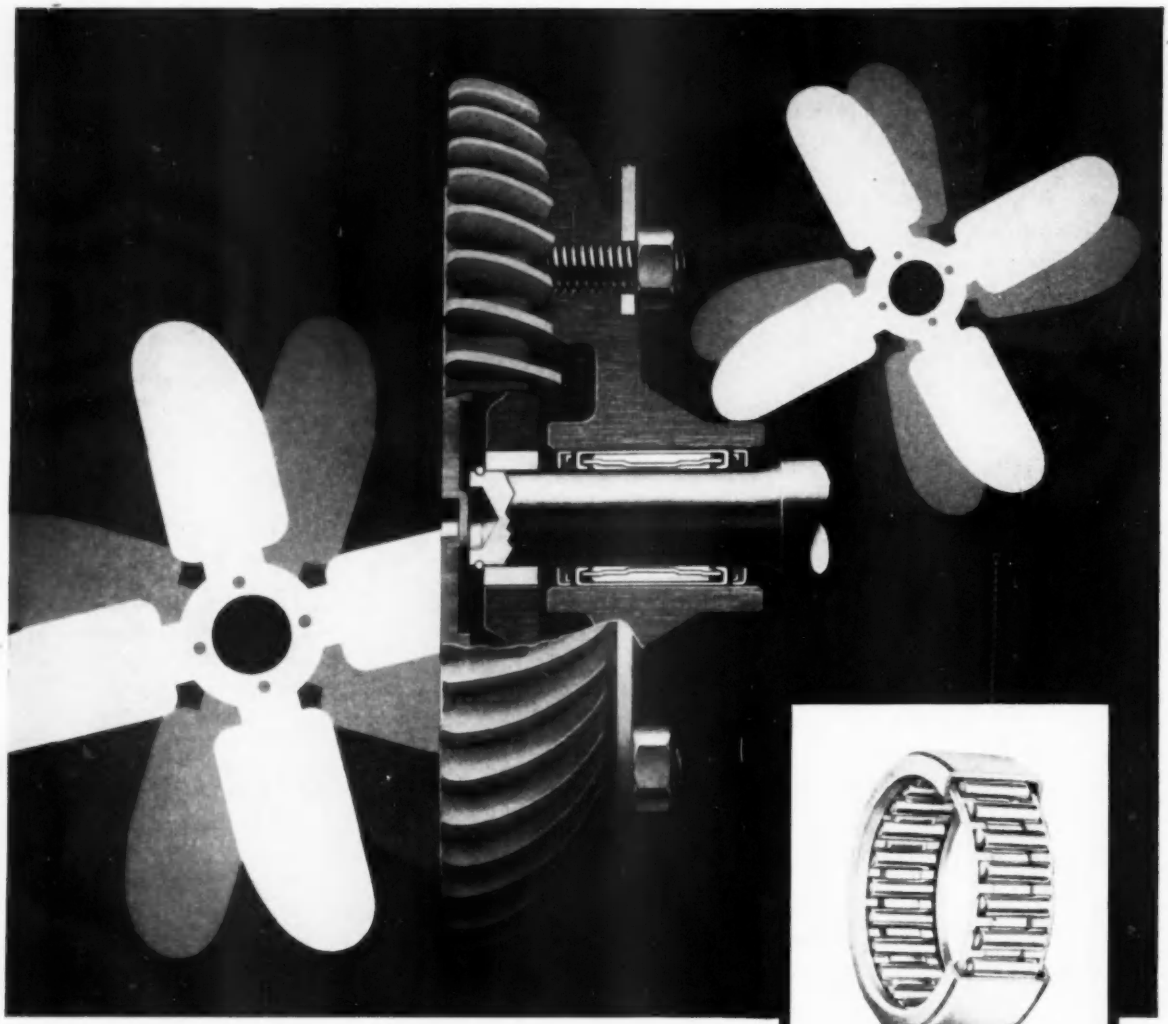
Minneapolis - Honeywell Regulator Co.—**Dr. F. J. Larsen** has been named vice-president, research.

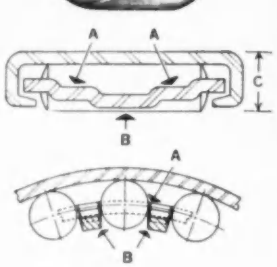
B. F. Goodrich Tire Co.—**E. C. Shingleton** was appointed manager of passenger tire sales and **J. E. Jerome** succeeds him as product manager of agricultural and industrial tire sales in original equipment sales.

Cleveland Cap Screw Co.—**L. J. O'Connor** is now sales manager, southeastern states.

Russell, Burdsall & Ward Bolt and Nut Co.—**J. M. Bell** was named assistant vice-president of sales in charge of the western division.

(Turn to page 86, please)





- rollers end-guided at pitch line (A)
- shaft-riding retainer (B) designed to permit lubricant circulation
- high capacity in small cross section (C)
- long pregreased life
- efficient at high speeds
- mounted by press fit
- simple housing design
- low unit cost

Schwitzer Variable Speed Fan Drive features new Torrington Bearing for economy, stability, lifetime lubrication

The original design of the Schwitzer Fan Drive, used in passenger automobiles to reduce fan horsepower and noise, called for two ball bearings. By replacing these with one Torrington Drawn Cup Roller Bearing, Schwitzer engineers have simplified the design and reduced costs.

This unique bearing firmly supports the drive housing and fan so they run true despite possible couple loads due to gyroscopic action. Ample lubricant reserve capacity permits pre-lubrication for the life of the fan drive.

Many new opportunities for economy, design simplification and operating improvements are opened up to engineers and designers by the new Torrington Drawn Cup Roller Bearing. Services of Torrington's engineering staff are offered to help you with product development work. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

Circle 134 on Inquiry Card for more data

The Big Show Begins

an Editorial

MID-SEPTEMBER, THE BIG SHOW of the 1960 car models begins impressively, destined to carry over in consecutive scenes through early November. In this issue, the first of a series of articles describing details of 1960 designs are presented. The first of the new compact cars is appropriately illustrated on this month's cover. To complete the presentations of new models, feature articles in more than four successive issues will be required. This industry's fascinating panorama of ingenious design, engineering, manufacturing and public presentation is unquestionably the most massive sequence of public viewings offered annually by any manufacturing field. The total printed texts on these new models published by this magazine will equal more than the page space required for a full length popular novel.

THESE EVENTS MEAN MUCH MORE than merely sales promotional presentations. For many prospective buyers, the availability of the 1960 automobiles will mean more and better jobs, more and better incomes, more and better business profit opportunities, more and better methods of safe transportation, and more vitally significant conveniences in multiplying the productive power of the entire field of American Industry and Trade. For millions of salesmen and engineers, better automobiles mean better uses of available productive working hours. For millions of housewives, better automobiles mean safer transportation of children to schools plus greater convenience of shopping for home supplies and moving about to keep homes efficiently and economically serviced. Such advantages are specific and tangible. They can be easily demonstrated. They can be readily proved. Because of these, satisfactory ownership of automobiles is basic to modern living.

AT THIS TIME IT IS APPROPRIATE TO RECALL the important fact that there are still thirteen million households in America which do not have an automobile for use by the family. There are more than 31,000,000 persons in the United States between the ages of 15 and 65 who do not have drivers' licenses. The needs and requirements of the market are far, far from being saturated. The potential for production and sales for 1960 may be well above the 6,900,000 level so frequently discussed. Many of those analysts most capable of estimating 1960 sales agree that a 6,900,000 car year is a more than conservative estimate.

FROM THE PREVIEWS THAT HAVE BEEN HELD for the press, it is clearly apparent that the industry has created major new features of appeal, color, comfort, style, safety, convenience, economy and utility for 1960 buyers. These in turn have been produced by innovations in design, engineering, processes, materials selections and equipment which represent the opening of another epochal chapter in modern automotive production. It will take months of publication of technical articles to cover even the highlights of such aspects which will be intensively read case histories of examples of successful design and production engineering.

IN ITS LARGER MEANING to the American people and to the American Economy, the opening of this BIG SHOW means something which is even more important. It is another chapter of fulfillment of the American dream of partnership in progress. It is an annual dramatization of the genius of American Industry at work, not only in the automotive industries plants, but also in the more than 15,000 suppliers plants. It is the fulfillment of the concept that the past is only the prologue, that the way to better jobs, better National security and better living is through producing new products, in better ways, that serve more people with greater utility and effective service. At this time of the year, America salutes the entire industry as the dynamic mainspring of the country's economic mechanism. But let us also take one more important step. Let's all work hard through every month to help reduce the excessive tax burdens which have been imposed upon both automotive manufacturers and users of the industry's products.

Harry W Barclay

Editor

Sealed Power 3-piece Stainless Steel Oil Rings hold their fit in the cylinder for two reasons: new abutment design (see enlargement); and new material (Stainless Steel).

The new design is engineered with the correct number of balanced spring tension points to assure the greatest possible flexibility to the ring. When compressed in the cylinder, an equal number of sturdy shoulders supporting each steel rail produces instant conformity to the cylinder bore and constant uniform pressure.

Because Stainless Steel used in Sealed Power rings is not affected by engine operating temperature, the desired pressure can be built in *and maintained* throughout the life of the ring. The expander does not have to be overstressed to compensate for tension loss after the engine reaches operating temperature. This eliminates ring drag and excessive wear . . . results in longer life.

OTHER KEY FEATURES

- Stop oil consumption
- Stop smoking even under high vacuum operation
- Side-sealing
- Quick seating
- Chrome-plated for long life

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO
DETROIT OFFICE • 7-236 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440

Sealed Power Piston Rings PISTONS CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911
Largest Producers of Sealing Rings for Automatic Transmissions and Power Steering Units

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New Features of Chrysler Corporation's 1960 Cars

By Joseph Geschelin
DETROIT EDITOR

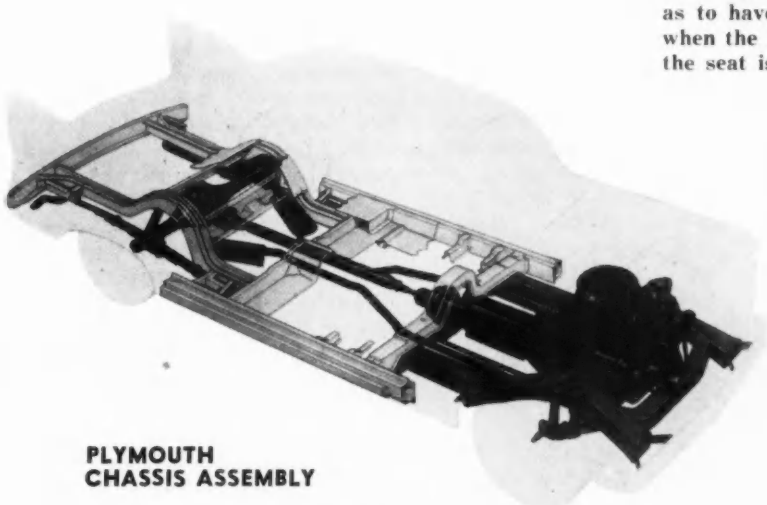
FOLLOWING the unique practice established by Chrysler Corp. a few years ago, we have the privilege of outlining some of the major mechanical changes and improvements common to all Divisions in advance of the new car announcements to come next month. No details have been made available on the Valiant since it will not be announced until the end of October.

Among the outstanding features to be described here is a line of unitized bodies for all divisions, including the Valiant. This does not apply to the Imperial, however, which continues with the same body shell. Perhaps the biggest news is a radical change in the induction system of certain V-8 engines. Briefly stated, it is a ram-induction fuel system with two outboard-mounted carburetors. The one on the left feeds the right bank; the one on the right feeds the left bank.

In addition, there is a family of new OHV six-cylinder engines mounted in the chassis in an inclined aspect at 30-deg with respect to the vertical axis. These engines are used in Plymouth and the Dodge Dart, another version being used in the Valiant.

A smaller, lighter version of the three-speed automatic transmission now is available for 6-cylinder Plymouth and Dart models.

Swivel front seats are continued but the mechanism has been changed in such fashion as to have the seats swing out automatically when the front door is opened—but only when the seat is unoccupied.



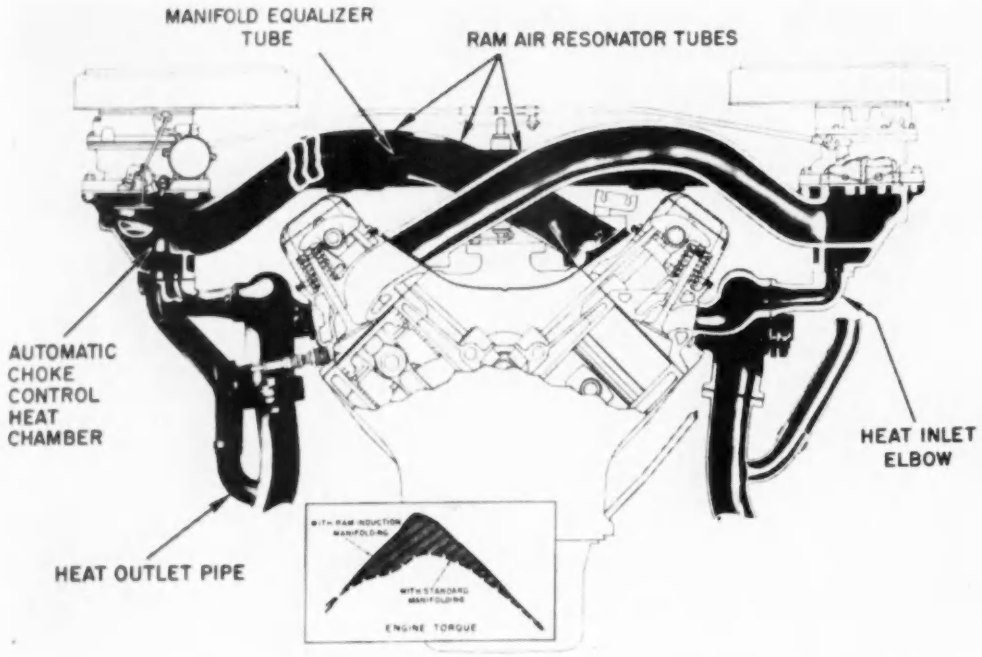
PLYMOUTH CHASSIS ASSEMBLY

Darkest areas—chassis components
Lighter areas—front substructure assembly
Lightest areas—Underbody structure (integral with body)

RAM INDUCTION

RAM induction, unique this year, is a special induction system designed for certain specific V-8's —Chrysler 300F; Plymouth 361-cu in.; Dodge D-500; DeSoto 383-cu in.—where high performance, particularly high torque in the medium speed range, is desired. The system employs two outboard-mounted four-barrel carburetors, the one on the left feeding the right bank; the one on the right feeding the left bank. The connection from the carburetor to the intake manifold on each side is by means of rectangular pipes, 30-in. in length.

Ram induction combines the ef-



Ram induction manifolding which is designed for certain specific V-8s

fects of mass inertia of the charge with sonic resonance of the column of gas in a tuned tube. This results in a ram effect which produces a certain amount of supercharging. It increases the density of the charge, improving volumetric efficiency materially. When the engine is operated under part-throttle conditions it is said to show good fuel economy.

Chrysler Division engines remain the same as before in basic specifications: the 383-cu in. engine with two-barrel carburetor and single exhaust system is supplied on the Windsor; the same engine with four-barrel carburetor and single exhaust is used in the Saratoga, with dual exhaust optional. The 413-cu in. engine is supplied on the New Yorker and Imperial with four-barrel carburetor and dual exhausts. The 300F, on the other hand, has the 413-cu in. engine with the ram induction system.

In addition, the 300F engine is fitted with a high-output camshaft; special large diameter, low restriction dual exhaust system; and special air cleaners.

On DeSoto, the 361-cu in. V-8 engine is standard on Fireflite models, while the 383-cu in. V-8 is standard on Adventurer models, both being fitted with two-barrel carburetors. High performance options of the 383-cu in. engine are available; one of these is a four-barrel carburetor option supplied on both Fireflite and Adventurer. The other is the ram-induction engine, available only on Adventurer.

ENGINE OPTIONS

PLYMOUTH offers a wide variety of engines, including the new six-cylinder OHV 225-cu in. engine to be described later. The Six is available on Savoy, Belvedere, DeLuxe Suburban, Fury four-door sedan, and the 4-door, 6-passenger Custom Suburban. The V-8's remain substantially as before.

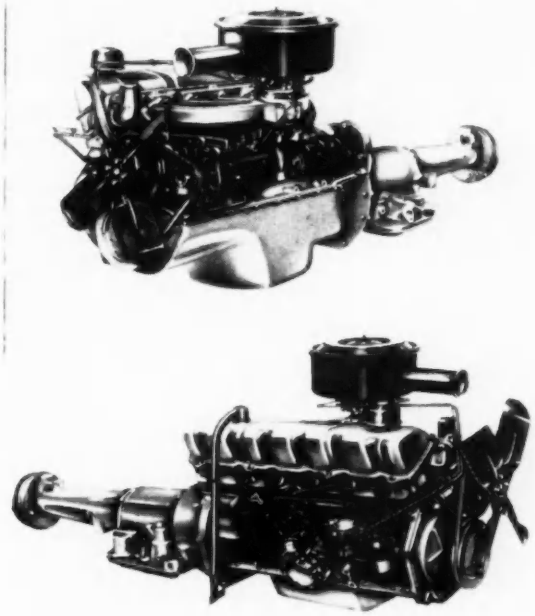
The 318-cu in. V-8, standard on the Fury series, is available on Savoy and Belvedere. The same engine with Super Pak—consisting of four-barrel carburetor, special high output camshaft, and dual exhaust—is optional at extra cost on all Plymouth V-8 models. PowerFlite or TorqueFlite drive is specified with this package.

This engine has some important improvements. Effective area of main bearings has been increased; timing chain lubrication has been improved; and intake valves now are aluminized.

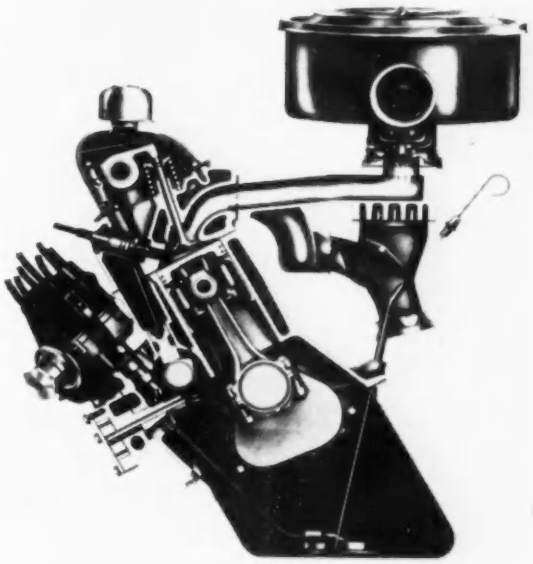
Two high performance Plymouth engine packages are offered, at extra cost on all models, in the 361-cu in. V-8 engine. First of these is the basic engine with four-barrel carburetor, dual exhaust, special radiator and clutch, and heavy-duty battery. A new heavy duty manual transmission is standard. Optional TorqueFlite drive, when specified, is modified for this package by the inclusion of a high-speed governor which raises shift points to higher engine speeds.

The second high - performance package consists of the 361-cu in. V-8 engine with ram - induction, dual exhaust, and heavy duty battery. TorqueFlite drive is specified for this option.

Dodge Division will enter the 1960 market with a variety of engines, including the 225-cu in. six for the Dart. Availability of engines is as follows: 361-cu in. V-8



Plymouth's new inclined six-cylinder engine and light weight three-speed automatic transmission



Transverse sectional view of the Plymouth 225-cu in. inclined six-cylinder engine

with two-barrel carburetor, standard on Matador models; the 383-cu in. V-8 engine with four-barrel carburetor is standard on the Polara models.

In addition, Dodge offers the D-500 power package for high performance, consisting of the 383-cu in. engine with ram induction system. This package is available as an extra cost option on both Dodge series, includes the TorqueFlite drive and dual exhausts as part of the package. The D-500 package also is made available on the special Phoenix models of the Dart.

All versions of Dodge V-8 engines have a compression ratio of 10 to 1. Single exhaust is standard on Matador and Polara models. Both PowerFlite and TorqueFlite drive are offered as optional equipment on Matador models; only TorqueFlite is available as an option for Polara models.

The new Dodge Dart offers four different engines in the line. Noteworthy, of course, is the 225-cu in. Six. It has a bore of 3.40-in. by 4.125-in. stroke, and a compression ratio of 8.5 to 1.

On V-8 models of the Dart, they offer the 318-cu in. engine in two versions: two-barrel carburetor version on Seneca and Pioneer models; four-barrel carburetor version on the Phoenix model. Both 318-cu in. versions have a compression ratio of 9 to 1. As mentioned above the Phoenix also will offer the special D-500 power package with ram induction, compression ratio of 10 to 1, and TorqueFlite drive as part of the package.

Among features generally applicable to all V-8's are the following: quieter timing chain; heavily reinforced generator bracket; improved oil pressure relief valve; 15-micron fuel filter with corrugated paper element; nylon distributor vacuum lines. Ignition cables are new, of resistance core type, making resistor type spark plugs unnecessary.

INCLINED 6-CYL ENGINE

APART from the ram-induction V-8, biggest news is in the introduction of the new 225-cu in. OHV Six, designed for installation in the chassis at an angle of 30-deg to the vertical plane, inclined to the right. This geometry was adopted to reduce the center of gravity; maintain low hood height; allow space in the engine compartment for the new manifolding system; and to permit mounting of the water pump on the side.

The intake manifold, made of cast aluminum, consists of six long, curved tubes leading to the individual cylinders from a single-throat downdraft carburetor. The exhaust manifold, mounted on the same side, has large-radius curves for minimum back pressure. A thermostatic heat control valve directs heat to a stove beneath the carburetor for better warm-up. A well-type automatic choke of conventional design is standard, with the sensing element in a pocket in the exhaust manifold.

Structural strength and rigidity stem from a compact and extremely rigid cast iron cylinder block with skirt extending below the main

bearing line. This is supplemented by a rigid, forged crankshaft having a large overlap between the four main bearing journals and crank pins. A torsional vibration damper is employed. The combustion chamber is of wedge-type design.

The cast-iron camshaft is driven by a silent timing chain. Valves are operated through solid tappets, tubular steel pushrods, and stamped rocker arms. Valve lash is adjusted by means of self-locking screws in the rocker arms. Intake valve stems are fitted with umbrella-type seals to prevent oil leakage; while exhaust valves have four-bead locks to facilitate rotation.

Engine weight has been held to the minimum by the use of aluminum, as well as the utilization of modern foundry techniques for reducing section thickness. Among the aluminum parts in this engine are: pistons; intake manifold; distributor housing; water pump housing; water outlet elbow; oil pump housing; oil filter mounting pad.

Starting with an entirely new engine has made it possible to arrange accessories in keeping with ease of maintenance. For example, the air cleaner, carburetor, intake and exhaust manifolds, water pump, generator, and starter are located on the left. Spark plugs, distributor, oil pump and filter, and fuel pump are on the right side. The dip stick is positioned near the front on the left side away from the exhaust manifold; while the oil filter cap is near the front of the rocker arm cover.

CHOICE OF TRANSMISSIONS

THE three-speed Torque-Flite automatic transmission, standard on all Chrysler Div. models, has been improved with the adoption of a one-piece valve body. This channels the flow of oil more accurately, promises smoother shifts and more consistent performance.

Three new transmissions are offered on Plymouth—two for the new Six; the other being the optional heavy-duty manual-shift transmission for the 361-cu in. engine option.

First of the new transmissions is a light weight, three-speed automatic drive designed as optional equipment on all Sixes. While identical in functional detail with the TorqueFlite drive, in design detail it is completely new. It features a one-piece, die-cast aluminum transmission case and converter housing and is so light that there is a difference of only a few pounds between it and a manual transmission when installed in a car. Internal components are of the same materials as in the TorqueFlite but are scaled down in size since torque loading is considerably lower. The torque converter is 10¾-in. in diameter, of three-element design, with torque multiplication of 2.2 to 1.

A new light weight manual transmission is standard equipment on all Plymouths, with forward ratios of 2.50-, 1.68-, and 1.0 to 1. Fury V-8 models, except those equipped with Super Pak power plants, use this transmission except that ratios are 2.12- and 1.43 to 1. This transmission is more compact and lighter than the previous model.

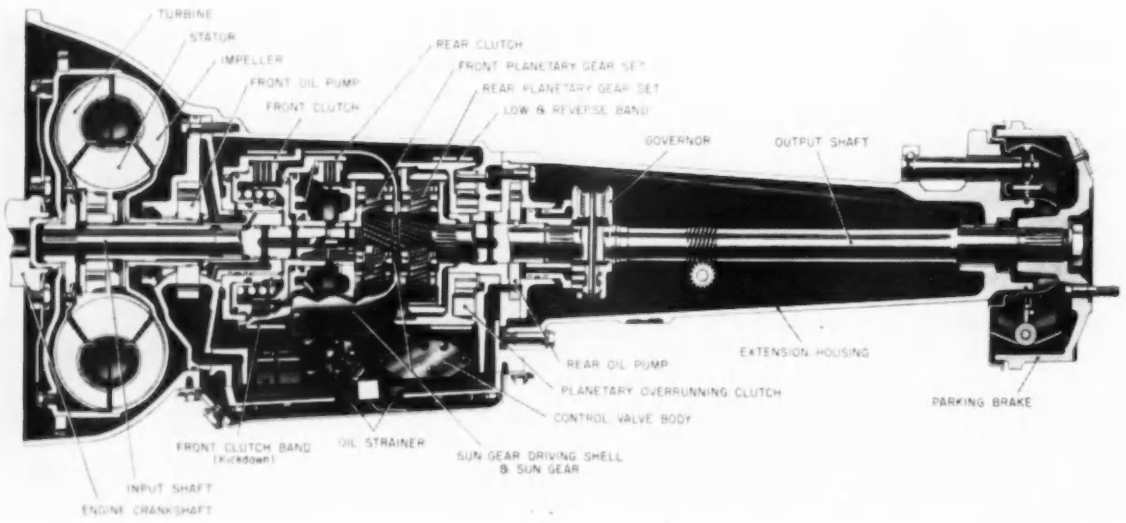
The Plymouth heavy-duty manual transmission is intended for high torque applications. Forward gear ratios are: 2.49-, 1.59-, and 1.0 to 1, reverse is 3.15 to 1. Strut-type synchronizers are used on second and high range.

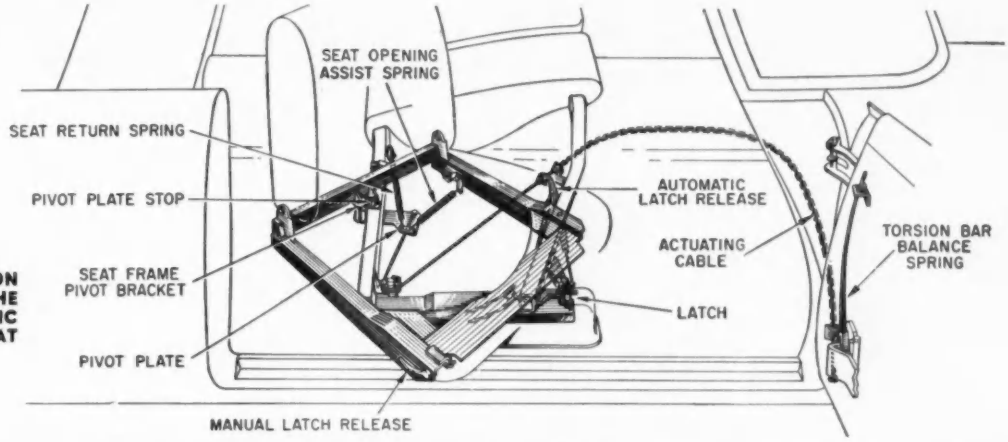
Easier clutch operation is promised with the three-speed manual shift transmissions with the introduction of a new semi-centrifugal clutch with lighter pressure plates. Six cylindrical flyweights have been added to make up for the lighter spring action.

SWIVEL SEATS

SWIVEL seats are continued but are offered in both an automatic and manually operated version. With automatic control the

Plymouth's new three-speed transmission

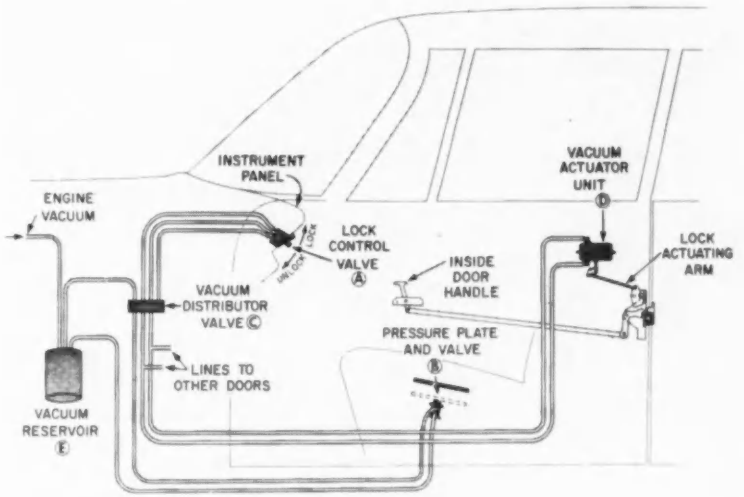




CONSTRUCTION OF THE AUTOMATIC SWIVEL SEAT

seat swings out when the door is opened, swings back when the door is closed. To effect this, one end of the actuating cable of the seat is attached to the door; the other end attached to a pivot plate under the seat. The pivot plate has two springs — the lighter one being hooked to the seat while the other is attached to the seat frame. A torsion-bar spring on the door hinge counteracts the effect of both springs so that the door opening effort is unaffected.

If the driver wants to keep the seat from swiveling when the door is opened, a gentle push is all that is needed to return the seat and latch it automatically.



SCHEMATIC DIAGRAM OF THE SAFE-T-MATIC DOOR LOCK

A—Lock control valve, selects distributor valve function
B—Pressure valve, prevents distributor valve from automatically locking doors if driver's seat is unoccupied
C—Vacuum distributor valve, directs proper pressure signal to vacuum actuator unit
D—Vacuum actuator unit, locks or unlocks the particular door
E—Enables locking functions when engine is not running

DOOR LOCKS

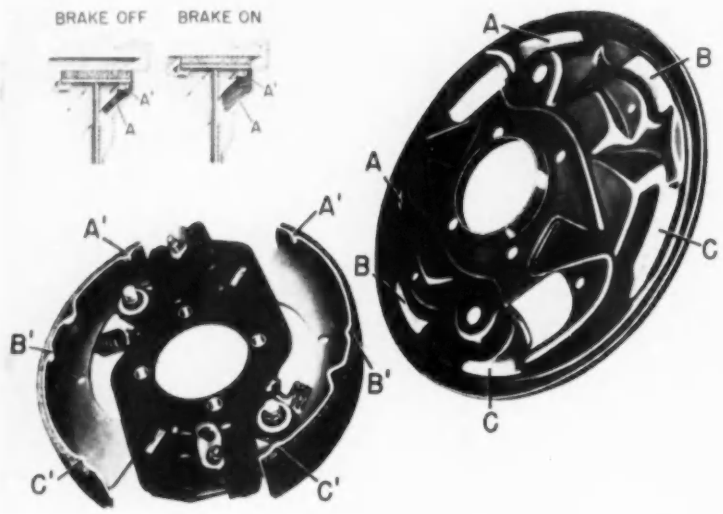
A NOTEWORTHY optional feature is the system of vacuum-operated door locks that assures secure locking of doors while the car is in motion. It comes in two types: automatic and manual. The automatic type—for four-door models—locks doors whenever the engine is running; the other is switch-operated. Regardless of the type, the driver must be in his seat for the system to operate. A pressure-actuated switch under the driver's seat prevents doors from locking when the engine is running while the driver leaves the car. Operation of the system is through a harness of rubber conduits, utilizing engine vacuum from the intake manifold, connected with two-way couplers in the doors.

UNITIZED BODIES

WITH the introduction of unit construction Chrysler Corp. cars have the chassis frame integrated with the body structure. The unitized body shell is firmly bolted to a front structure which supports the engine and front end suspension. The floor has been lowered and higher, posture-controlled seats provided. Moreover, there is more room between the steering wheel and the knees.

Door pillars are stronger than previously, as are the door hinges. Front fenders and grilles can be readily removed in the event of collision damage.

In the body development program electronic computers were employed for evaluating prototype plastic scale models to select the one best structural design. The body structure eventually adopted



Three-platform total-contact brake (front wheel) with lettered areas on shoe aligning with corresponding lettered areas on backing plate

is said to have a 100 per cent improvement in rigidity and a 40 per cent gain in beam strength compared with the previous four-door sedan.

The unit structure contains sturdy box-sections of heavy stampings extending upward from the sills, along the sides of the roof, over window openings, and into the rear section where the body is locked into the wheel housings. Connecting this structure are heavy transverse box girders, spanning the body shell at the floor pan and at upper and lower edges of the windshield and rear windows.

ELIMINATION OF BODY CORROSION

STEPS have been taken in body manufacture to eliminate the effects of body corrosion. This stems from a special rust-proofing procedure, entailing an outlay of some $18-million for conveyor and dipping installations in various Chrysler plants around the country. The rust-proofing cycle alone take 1¾-hour in a setup running some 2300 feet in length.

Rustproofing begins with the raw steel which is given three spray baths of metal cleaner to remove all traces of oil and dirt. Then the stock is coated with a special drawing compound as it is routed to the blanking presses. The complete body structure is put through the rust-proofing cycle with the following sequence:

1—Three minute immersion in alkaline cleaner to a depth of 18-in. while high-intensity alkaline sprays soak the upper portions of the body. Water is held at a temperature of about 180 F. The body is drained for 50 seconds after each immersion.

2 & 3—Warm water rinses of 30 seconds each, with temperature varying from 160 F to 140 F.

4—Immersion in a 130 F phosphate spray bath for one minute.

5—Thirty-second cool water rinse and drain.

6—Immersion and spray with chromic acid and conditioner chemicals for about 30 seconds at temperatures ranging between 140 F and 150 F. The body is drained and blown-off with high pressure air, moves into a drying oven where it is held for three minutes at 225 F. Hot air jets are employed in the process. Then it enters a cooling stage to reduce temperature to about room temperature.

7—The body now moves to a dip tank filled with a gray, water soluble primer. It is immersed for about 1½ minutes, then drained.

This completes the anti-corrosion process. Incidentally, this procedure applies to all Chrysler Corp. bodies, including the Valiant.

BODY ASSEMBLY

CAR assembly, incident to the unitized body construction, differs considerably from the conventional. First step is the installation of the power plant and front suspension assembly to the front sub-structure assembly. This is done on a special dolly riding on the assembly conveyor. To this initial assembly are added the propeller shaft, rear axle, rear springs, and rear wheels. Body drop takes place at this stage, followed by attachment of torsion bars, rear springs, exhaust system, and other components directly to the body.

Silent engine mounts of new design are employed, with front mounts having more rubber. The rear mount consists of a rubber block in series with a heavy coil spring, the latter permitting the engine to pitch freely within a limited range of movement.

The rear suspension has large diameter rubber bushings for the leaf spring eyes.

The exhaust system has been improved by rerouting the piping through the propeller shaft tunnel to provide greater protection as well as to allow the floor pan to be dropped lower. A new ball-joint exhaust pipe connection just ahead of the muffler permits of accurate alignment at assembly, making the entire system free to vibrate, expany, and contract.

Torsion-Aire suspension has new rear anchors with micrometer adjustment screws.

STEERING AND BRAKING

A NUMBER of refinements have been made in the power steering mechanism. One of these, introduced last year, is a spring-loaded ball guide, two of the guides being used on the steering worm shaft. Newer features include a power piston seal which reduces parking effort and improves efficiency by reducing the flow of oil from one side of the piston to the other; and a faster-acting spool valve to provide a more precise feel and quicker response.

Brakes have been redesigned to a three-platform geometry, that is, the brake backing plate has three stamped-in platforms for each shoe, bearing against three corresponding projections formed into the shoe. These form a plane of contact which assures extremely accurate alignment, causing the shoe to contact the drum squarely.

(*Turn to page* 106, *please*)

Latest Mercedes-Benz has a new body and front end styling

New Mercedes-Benz Has Greater Length, Shorter Wheelbase

THE latest Mercedes-Benz 220 has an entirely new body with wrapped windshield and rear window, and elongated headlamp units. Length is increased by 5 in. to an overall 187 in., enlarging the trunk by 50 per cent to 22.6 cu ft. While the wheelbase is shortened to 111 in. for improved handling, there is no loss of leg room or between-axle passenger space since the engine is placed farther forward over the front wheels.

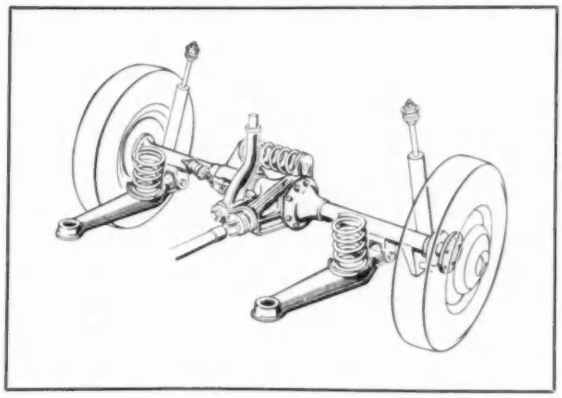
Among mechanical changes is a new front-suspension sub-frame joined to the chassis-floor by rubber mounts and supporting the engine by two horizontal arms bolted to sides of the block.

As illustrated, the single-joint swing axle now has an additional compensating spring located above the pivot point as on the 300-SL sports car.

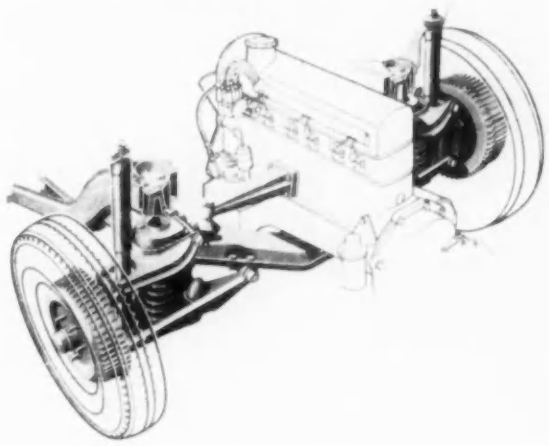
This new model replaces the earlier 219, and is powered by a six-cylinder-in-line overhead-camshaft engine of 134 cu in. piston displacement, rated 105 bhp gross at 5000 rpm.

The same basic body is used for the new 220 S (124 hp) and fuel-injection 220 SE (134 hp) models. ■

Single-joint, swing-type rear axle now has a compensating spring located above the pivot point



Front suspension of the 220 Model supports the engine by arms bolted to sides of the cylinder block



Four-door Falcon sedan

The FALCON
Ford's New COMPACT Car

ONE of the first cars announced for the '60 season is the long-awaited Ford Falcon. Unlike some of the imports this car will accommodate six passengers and has excellent acceleration and performance, comparable to the standard Ford Six. It is available in two-door and four-door sedan models, mounted on a 109.5-in. wheelbase, having curb weights of 2366 and 2395 lb, respectively. Overall length is 181.1 in., width 70 in., and height 54.5 in.

Perhaps the most noteworthy feature of the Falcon is that it has a new unitized body construction, eliminating the chassis frame. With this design Ford has developed replaceable, bolted-on front fenders.

Apart from the fact that everything about the car is new and scaled down to meet gross weight objectives, all of the units including the six-cylinder engine are convential in design. Moreover, a great deal of attention was paid to detail with the result that the entire car has been tailored for simplicity, a reduction in the number of parts where possible, and low weight. For example, the new engine weighs only 345.5 lb.

The Falcon engine has a displacement of 144-cu in. and is of overhead valve design. With a bore of 3½-in. and stroke of 2½-in. it is oversquare to the extent of 1.4 to 1. The stroke is one of the shortest in the industry. The Falcon engine develops maximum bhp of 90 at 4200 rpm. Torque rating (max.) is 138 lb ft at 2000 rpm. Compression ratio is 8.7 to 1.

While the engine is of cast iron construction the flywheel housing is of aluminum and so is the transmission extension.

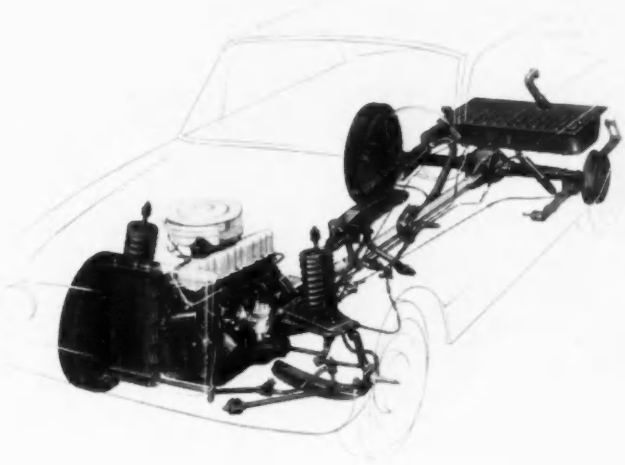
The engine is fitted with a simple single-throat carburetor. It has a crankcase capacity of 4.5 quarts. The air cleaner has a dry replaceable element. Cooling system has a capacity of 8.7 quarts.

The electrical system is of 12-volt type, employing a newly designed starter. The wiring system uses quick disconnect terminals and connections. The instrument cluster is a separate "floating" type unit set into the instrument panel.

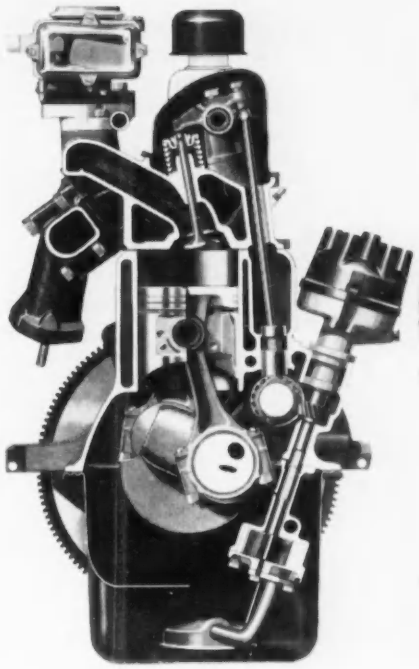
The drive shaft is 2½-in. OD with a standard U-joint front and rear. Low profile 6.00 tires mounted on 13-in. wheels are used.

The front suspension system employs the same ball joint principle as is found on Ford cars except for differences shown in the illustrations, the main difference being in the placement of the coil spring and shock absorber. As illustrated, the spring and shock absorber are mounted on the top surface of the upper control arm, the upper end being housed in a rigid tower mounting in the front body section. The lower arm has a stabilizing strut, forming with the lower arm the so-called A-frame to guide the lower part of the spindle. This strut also serves to cushion the fore and aft thrust of the suspension. Ball joints are of standard steel construction similar to those on Ford cars. The front suspension also incorporates the antidive characteristics featured in Ford cars.

The rear axle represents a departure from the basic design employed by Ford in recent years. In-



Phantom view showing arrangement of power plant, front and rear suspension, etc., of the Falcon



Transverse sectional view of engine

stead of the banjo section, which is a welded assembly of stampings, the Falcon axle uses a malleable iron differential carrier into which the tubular extensions are pressed. The differential case is a one-piece casting, adjustment of gear mesh for the drive being accomplished by means of an adjusting collar on each side. Gear ratio is 3.1 to 1 for both the standard three-speed manual shift transmission and the optional two-speed Fordomatic. A gear ratio of 3.56 to 1 is available as an option with either transmission.

The steering system is of conventional design with overall ratio of 27 to 1, employing a manual type recirculating ball steering gear and linkage with steel joints.

The special system of 9-in. diameter brakes designed for this car is said to have some 30 less pieces to service than present day duo-servo brakes. They are intended to use without power.

Rear suspension is of Hotchkiss type, employing five-leaf rear springs with a large, isolating front eye bushing and axle insulator to minimize road noise transmission.

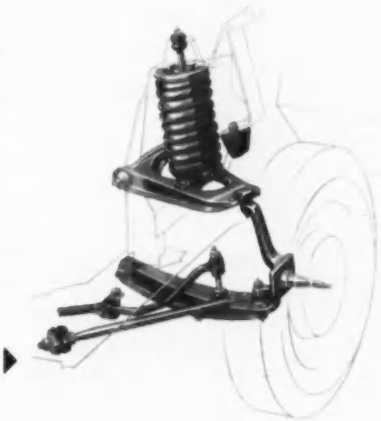
As illustrated, an 8½-in. "pot" type clutch has been designed for this car.

Doors are thin and light weight; while rocker panels and other structural members at the lower end are of rust-resistant galvanized steel.

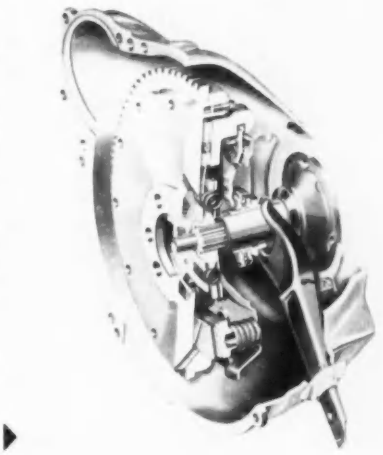
The heating and ventilating system has a cowl intake, leading to a six-inch-diameter built-in duct. Manually-operated doors are fitted to the two ventilating outlets, eliminating the usual dampers and control cables. Baffles for water separation permit ventilation during heavy rain storms.

The heater assembly consists of a two-speed blower unit, outlet plenum, housing, core, and damper doors. The "blend-air" system permits variations in output air temperature by mixing outside air with heated air from the heater core—as contrasted to the practice of varying water flow through the heater core. Varying the position of the temperature control door changes the ratio of outside air to air through the heater core.

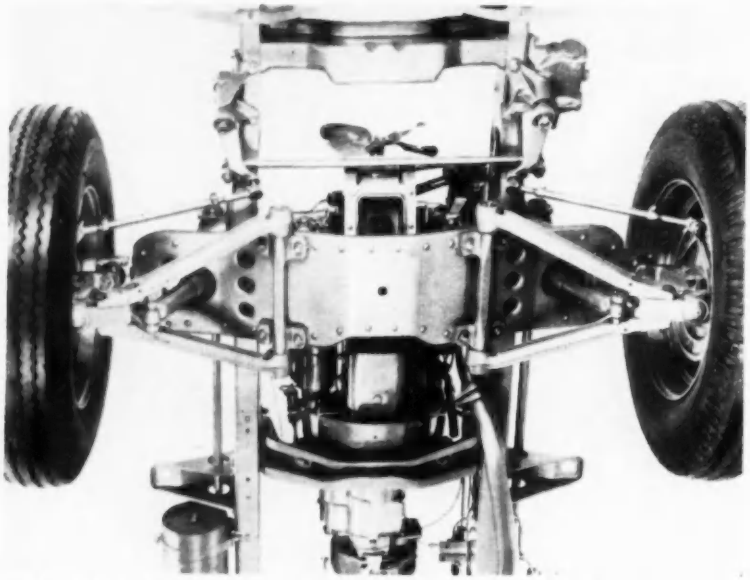
When the defroster knob on the instrument panel is pulled out, the heater output is directed through twin 2½-in.-diam tubes to a round outlet each side of the combined radio-defroster grille on top of the instrument panel. ■



Front suspension assembly. Note that front spring and shock absorber are located on top of the upper suspension arm



Cutaway view of clutch and flywheel assembly



Bottom view of completely redesigned front suspension of medium and heavy-duty trucks with individual torsion rod springing of wheels

Chevrolet Trucks Have Torsion Bar Springing

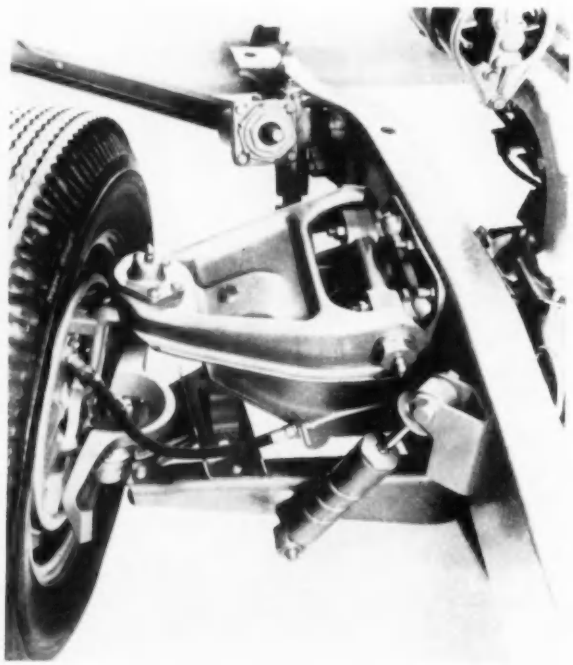
THE 1960 Chevrolet truck line introduces independent front wheel suspension with ball joints and torsion rod springing on all but two models. Also an innovation is a two-link coil spring rear suspension on one-half and three-quarter ton models. Variable rate, two-stage leaf spring rear suspensions are new on two-ton and up models.

Tandems are equipped with the Eaton-Hendrickson tandem drive and feature a built-in power divider and inter-axle differential.

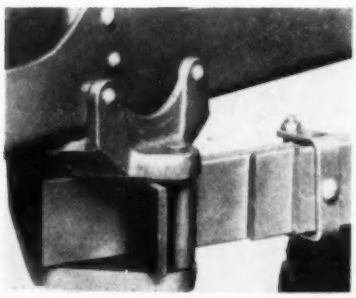
Addition of several new models and the elimination of some previous ones results in a net expansion of the line to 165 models, an increase of 26. Wheelbases have been consolidated into 18 different dimensions, compared with 22 in the 1959 line.

The re-engineered front suspension is used in all series except four-wheel drive and forward-control models. Because of front driving axles, independent springing has not been adapted to four-wheel drive units. Step-Van and forward-control models are retained in the line with conventional design for the installation of custom-built bodies.

Design of the new front suspension system is basically the same in all series trucks, but with certain variations. Structural components increase in dimension from the lightest to the heaviest models consistent with imposed stresses. The assembly consists of a rugged crossmember and upper and lower control arms. Forged steel knuckles and spindles are supported by ball



Top view of individual front suspension of the light-duty trucks, showing upper and lower control arms, forward mounted steering gear and shock absorber placement



The small illustration at right, and on next page, show how rear springs on two-ton and up models feature marked changes in design from previous years

Total redesign of styling marks the 1960 Chevrolet truck line; shown here is light-duty panel model

joints attached to the outer ends of the control arms, which pivot on hardened steel shafts.

Control arms on light-duty models are steel stampings. On heavier series, the upper arm is an Arma-Steel casting. The lower unit consists of two forged steel pieces.

Another truck first for Chevrolet is the use of torsion rod front springing of the independent front suspension. Torsion rod mounting is generally similar in all series, but location varies. In light-duty models the hex shaped forward end fits into a hex section of a tube welded between the fore and aft sections of the lower control arm. The rear anchor is in a hex socket at the end of a lever arm suspended from a crossmember by an eye-bolt to provide adjustment.

On medium and heavy-duty series, the forward attachment of the rod is to the upper control arm for horizontal location along the frame rail to a fixed anchor. Since the forward anchor is in the center of the control arm pivot, no bending forces are imposed and a fixed anchor is provided.

Another feature of heavy-duty installations is use of a graphite-impregnated, fiber-reinforced phonolic resin pivot shaft bushing. It has low friction, does not bind under misalignment, is not easily damaged by improper lubrication, and is inexpensive to replace.

Rear chassis configurations also have been redesigned. In light-duty series, one-half and three-quarter ton models have two-link coil spring rear truck suspension. On one- and 1½-ton models, conventional leaf springs are used with extensive improvements.

In the unique two-link system, all fore and aft thrust and rotational torque are absorbed by two steel channel control arms running from the outer ends of the axle housing to an apex near the center of the new X-member frame reinforcement. Attachment is through rubber bushings.

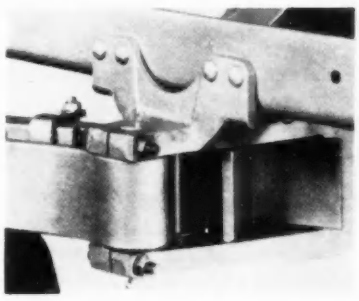
Transverse forces are absorbed by a stabilizer bar attached to the right axle housing and running laterally to the left frame rail. Both ends are rubber bushed.

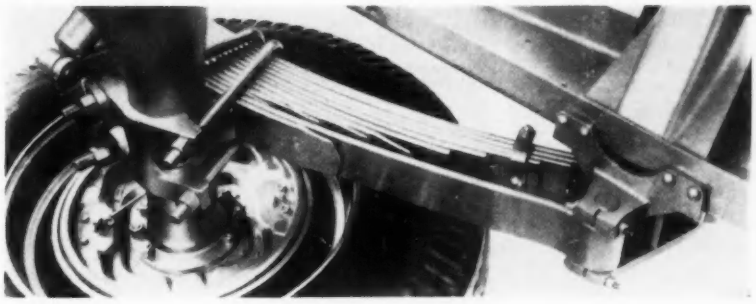
Coil springs are seated on the control arms just ahead of the axle, with the top ends attached to the frame. With control arms and stabilizer absorbing all driving and braking forces, springs with a low deflection rate are used for a softer ride.

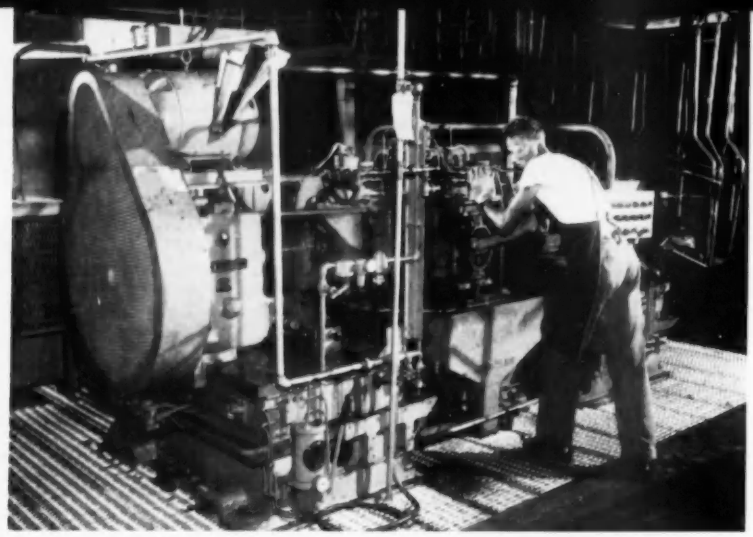
Improvements in the rear leaf spring system of one and 1½-ton models consist of: replacement of old compression type shackles with tension type; changes in shackle

(*Turn to page* 128, *please*)

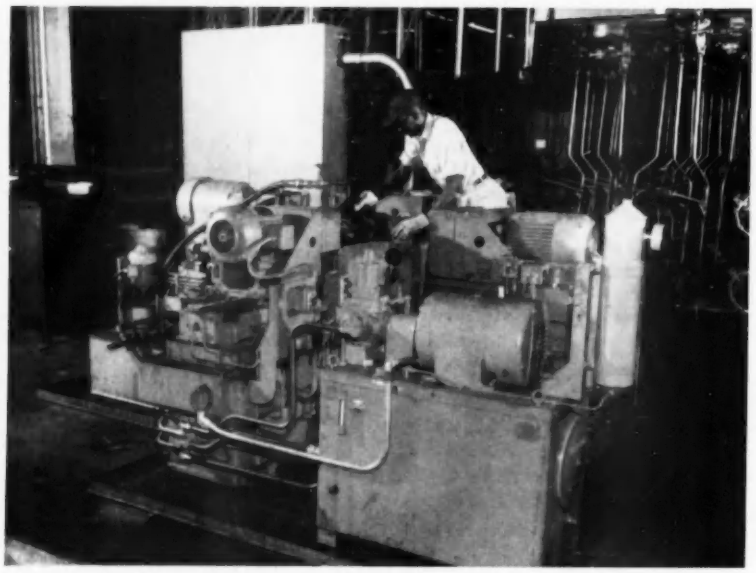
Two-stage, variable rate rear spring of the new medium- and heavy-duty trucks





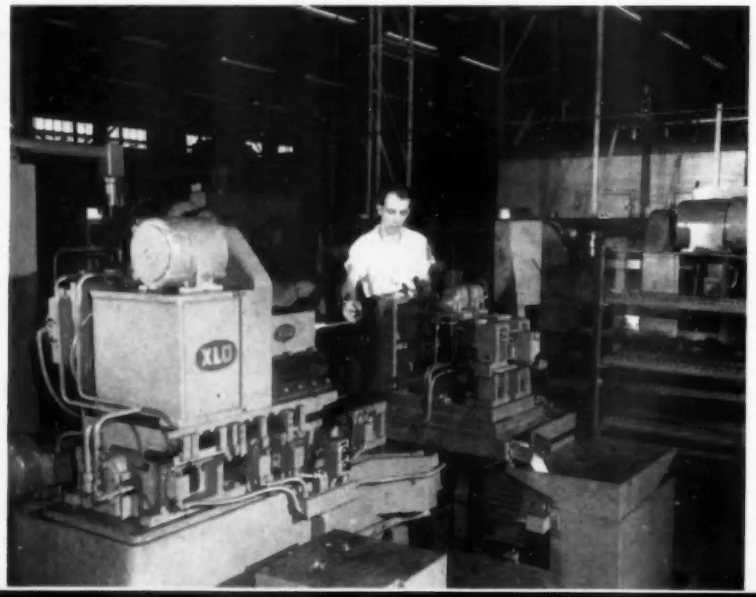


Four-station Ingersoll milling machine for handling the Falcon differential carrier



View of the Snyder four-way precision-boring machine for operations on the differential carrier

Ex-Cell-O two-way precision-boring machine—typical of the equipment for boring the carrier



Making the for Ford's

By Joseph Geschelin
DETROIT EDITOR

ALTHOUGH the Falcon rear axle may be termed as being of conventional design, it does differ considerably from the basic Ford design of recent years. One of the major differences is in the housing. Instead of employing the usual banjo which is a welded assembly of stampings at Ford, the Falcon housing has a malleable iron differential carrier with tubular extensions pressed into its ends.

The differential case is a one-piece casting with "windows" to facilitate gear assembly. As illustrated, the differential assembly has positive adjustment for the alignment of the drive gear set by means of screw collars on each side. The drive pinion, in turn, is mounted on two, wide-spread tapered roller bearings, end-wise play being taken up by means of the crush-type spacer at the front bearing.

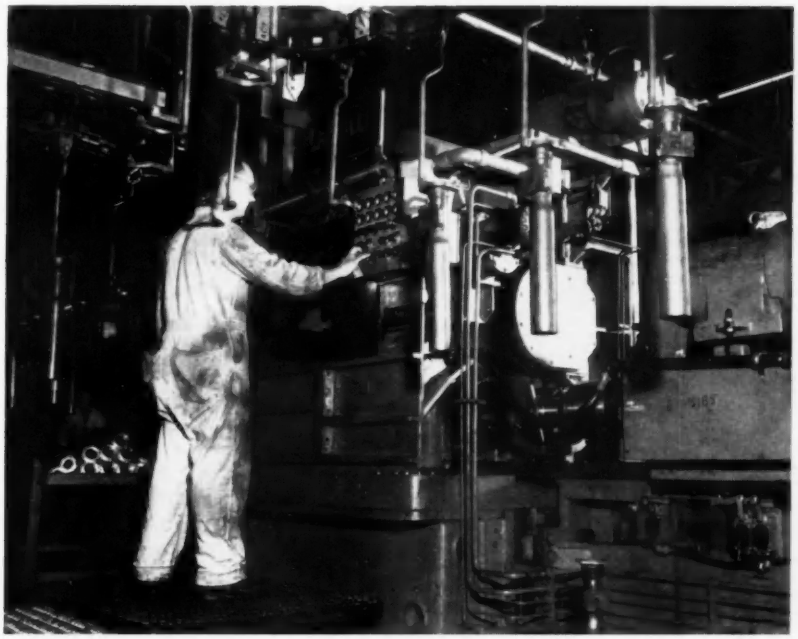
The tubular extensions on each side are pressed into the carrier and held securely by means of "puddle" welds.

There are doubtless many reasons for adopting this kind of design for the Falcon. Perhaps the most compelling reason at this writing is because it entails a minimum amount of tooling for the start of production.

Like the other axles in the Ford family, the Falcon axle is produced at the Ford Sterling Chassis Parts Plant outside of Detroit.

From a manufacturing standpoint, the chief difference between the Falcon axle and the other axles

Newly Designed Axle Falcon Model Car



One of the LaSalle trunnion type, double-end machines for various operations on the tubular axle ends. Machine has automatic cycle except for loading and unloading

produced in this plant lies in the elimination of the stamped banjo section. In its stead is the malleable iron carrier which forms the backbone of the entire axle. This has been tooled economically in a separate section of the plant, using mostly available surplus machinery and some few new items of equipment. In keeping with projected volume, all operations are performed in individual machines with automatic cycles but without resort to automation.

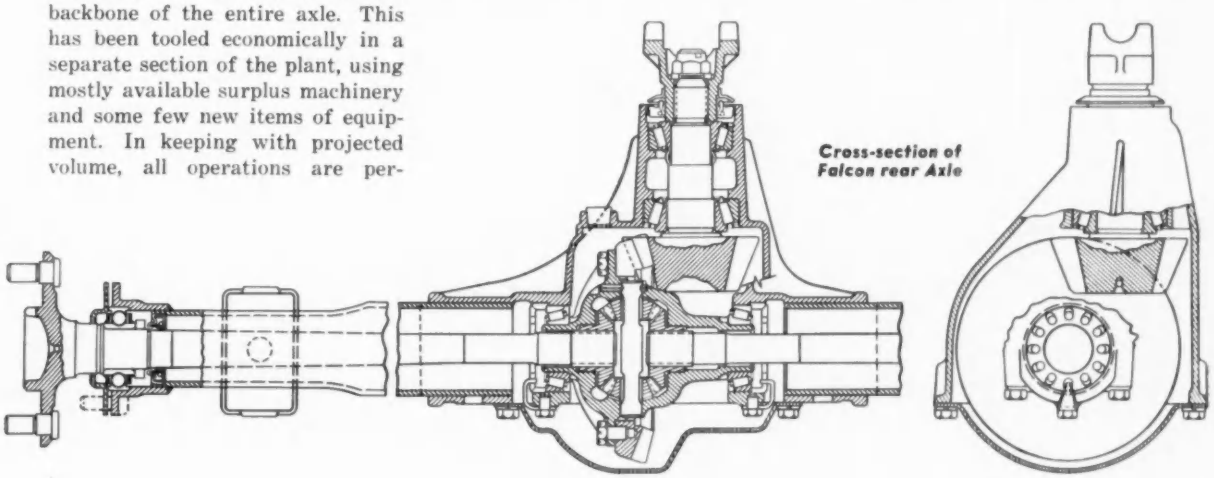
It may be noted at this point that the adoption of the carrier has made it possible to make a complete carrier assembly, fully aligned and adjusted which is sound-tested before the rear axle is finally built up. Upon acceptance in the sound booth, the carrier assembly is transported to a horizontal press where the tubular ends are pressed in with an interference fit. Each carrier extension has a number of large drilled holes. The tubular ends later are held securely by "puddle" welding through these holes.

The housing assembly is placed on a short conveyor section as it leaves the press. The cover is attached and secured by means of eight fastenings that are made up by means of a multiple-nut Ingersoll-Rand nut runner. The assembly then proceeds to the welding booths where the puddle welds are produced with portable, manual arc welders.

Key operation on the carrier housing is the milling of the large diameter face plus several other related operations, performed in a four-station, three-head Ingersoll

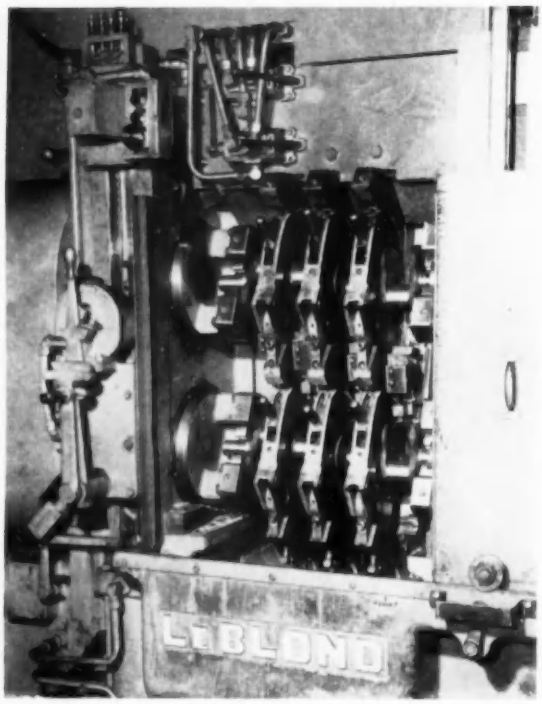
(*Turn to page* 108, *please*)

Cross-section of Falcon rear Axle



Close-up of Wickes center drive crankshaft lathe tooled for rough- and finish-cheeking the main bearing line of V-8 crankshafts.

Operations on crankshaft pin bearings are handled in a group of the familiar LeBlond crankshaft lathes, the one for rough-turning being shown here. All of the crankshaft lathes are manually loaded and unloaded.



Machining of Crankshafts and Cylinder Heads at IHC Engine Plant

PART II

By Joseph Geschelin
DETROIT EDITOR

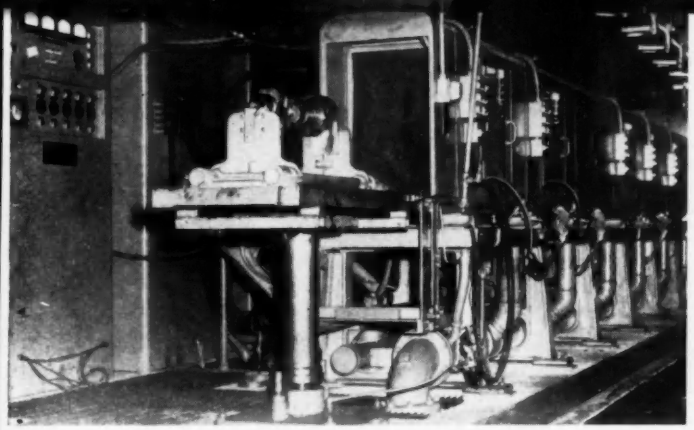
In a previous article (AI, Aug. 15, 1959) we presented a brief summary of transfer machine operations on cylinder blocks for the new family of V-8's being produced at the Indianapolis engine plant of International Harvester Co. This report deals with a sampling of operations on crankshafts; and transfer machine operations on cylinder heads.

Before going into the details of the several components covered in this article, it is important to note that Harvester has three different general cylinder head specifications, differing in displacements and in valve spacing. Despite these differences, all cylinder heads go through the same transfer equipment in batches without affecting the heads of the machines.

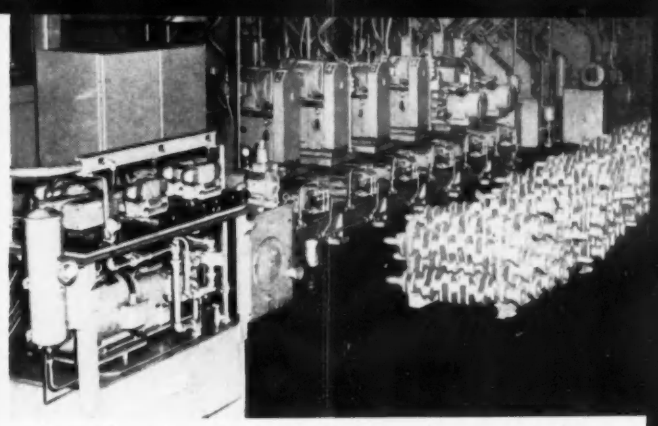
Fortunately, these changes affect only one machine in the line—the 26-station W. F. & John Barnes transfer machine. In this case, intake and exhaust valve guide bores are drilled at separate stations for convenience. Cylinder heads are put through in batches, the differences in valve spacing being accommodated by mechanically resetting the locating pins in the fixtures. Thus it is readily possible to change valve spacing for each of the heads. Presetting is done mechanically at the time the conveyor locations are altered.

The same machine, as noted later, has a special Gear-O-Mation attachment supplying valve guides to the pressing-in station.

The line of three basic engines has three crankshafts, each with a different balance specification; however, the V-266 and V-304 crankshafts are dimensionally the same with the same crank throw. This makes it feasible to employ automatic equipment, including an extensive Avey transfer machine for drilling oil holes.



Perspective view of tunnel type Tocco induction hardening machine for hardening and drawing all journals and pins.



Perspective of part of the 25-station Avey crankshaft drilling transfer machine. It drills oil holes through main bearing journals; drills two oil holes in each pin; drills, chamfers, and taps nine flywheel mounting holes; drills, chamfers, and reams the flywheel dowel hole.

CRANKSHAFTS

FOR THE FIRST TIME IN ITS EXPERIENCE at the Indianapolis plant, Harvester employs a group of Wickes crankshaft lathes primarily for turning operations on the main bearing line. Starting with the rough forging, the first step is the milling of a group of locating pads and notches, using a special six-spindle Sundstrand milling machine. This provides the usual means of locating in all subsequent operations.

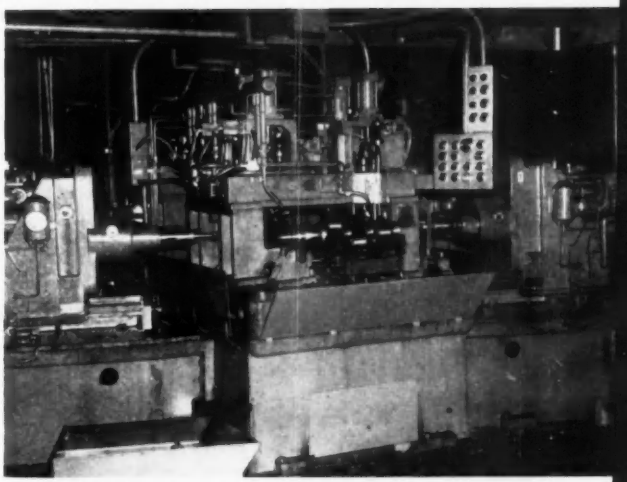
Next is a group of Wickes center drive crankshaft lathes for rough- and finish-cheeking the front side of four cheeks and the back side of alternate cheeks; facing both ends of the shaft to finished length. In addition, there is the turning of all main bearings and other diameters on the main bearing line, together with finish-facing and turning of the flange and pilot.

Main bearings then are rough-ground in a Landis five-wheel grinder and transferred to the second Wickes crankshaft lathe for a group of operations, including: finish spacing and forming radii at both ends of main bearings as well as another diameter; facing and chamfering the front of the No. 1 main bearing; chamfering the front end of the shaft.

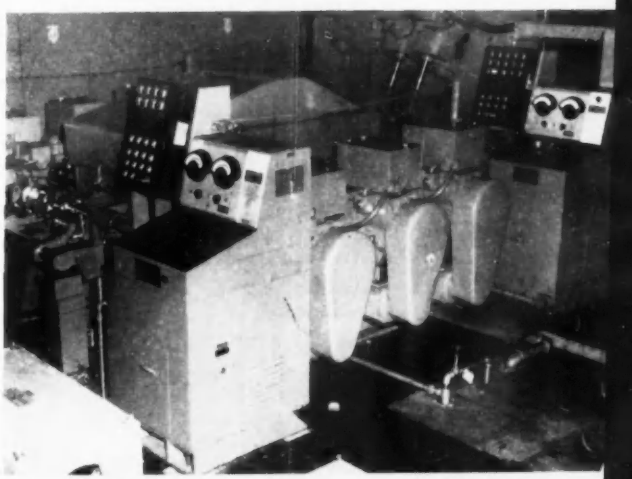
The familiar LeBlond crankshaft lathes are installed on this line for turning pin bearings. First operation in a LeBlond AC lathe is the rough-cheeking of pin bearings. This is followed, in a second LeBlond lathe, by rough-turning of all pin journals. A Jackson crankshaft lathe of double-end type turns and chamfers the OD of counterweights.

Work now enters an impressive 25-station Avey transfer machine for handling a wide variety of drilling operations, including sensitive drilling of oil holes. Included in this sequence are the following: drill, chamfer, tap nine flange holes; drill, chamfer, tap one locating hole; drill and chamfer oil holes through main bearings; drill two oil holes from each pin to the main bearing cross hole. Altogether this machine has 59 active spindles in action.

Following several individual operations the crankshafts are routed to a large Tocco induction hardening



Michigan Drill Head transfer machine on the crankshaft line. It is arranged for drilling four lightener holes, one in each pin bearing.



The special four-station Tinius-Olsen crankshaft balancing machine which provides a finish-balance of 0.25 oz. in. First station, in the foreground, handles initial balance, correcting by drilling three, 1-5/16-in. holes in No. 1 and No. 8 counterweights at the second station. Final balance is corrected at Station 3, in the background, and the small amount of metal removal then is handled at Station 4, to the left of the balancing unit, by drilling small holes in the periphery of No. 2 and No. 7 counterweights.

machine. Here all journals are induction-hardened, drawn, and cooled.

An interesting 7-station Michigan Drill Head transfer machine has been installed for drilling four lightening holes—one in each pin.

This is followed by a series of finish-grinding operations, including angle grinding of flange and pilot bosses, gear and pulley diameters. Straightening of crankshafts is seldom necessary but a series of IMPCO straightening operations is provided preceding finish-grinding; and at the end of the cycle just preceding the balancing operation.

Final balancing of crankshafts is done in a unique transfer arrangement developed by Tinius-Olsen to suit the special requirements. First operation is essentially an approximate balance, followed by drilling three, 1-5/16-in. diameter holes longitudinally in the No. 1 and No. 8 counterweights at Stations 2, 3 and 4. Station 5 is idle and at Station 6 the work is balanced to the final tolerance of 0.25-oz in. in another Tinius-Olsen electronic balancer. At this station small holes are drilled with a bank of vertical spindles in the periphery of the No. 2 and No. 7 counterweights.

The last major step is the polishing of all bearing areas and thrust walls of the No. 3 main bearing to a surface finish of 10-20 microinch; and polishing the OD of the flange to a surface finish of 16 microinch, maximum. It may be noted too that main bearing diameters are held to a final tolerance of plus or minus 0.0005 in.

CYLINDER HEADS

Apart From Numerous Individual Operations and assembly stations, cylinder heads are processed over a transfer machine line of advanced character. Justified by volume, Harvester has installed one of the enormous Cincinnati horizontal surface broaching machines at the start of the line for finish-broaching the four major plane areas. The rest of the line consists of a 17-station Greenlee transfer machine; and one of the 27-stations. In addition, there is a 26-station W. F. & John Barnes transfer machine.

Rough castings are presented to the Cincinnati surface broaching machine on a roller conveyor with an automatic "Levelator" at the loading end of the machine. Its function is to lift the castings to the level of the operator for easy handling. The broaching machine is of typical Cincinnati design, featuring four stations. The operation finish-broaches the rocker arm face; intake manifold face; exhaust manifold face; and semi-finishes the gasket face.

Next comes the 17-station Greenlee tooled for drilling and reaming reference holes; drilling holes in top and bottom; drilling and tapping intake and exhaust manifold faces. Each of the stations has a RH and LH head and each work station is provided with a work-holding fixture.

Eight holes are drilled at the LH head of Station

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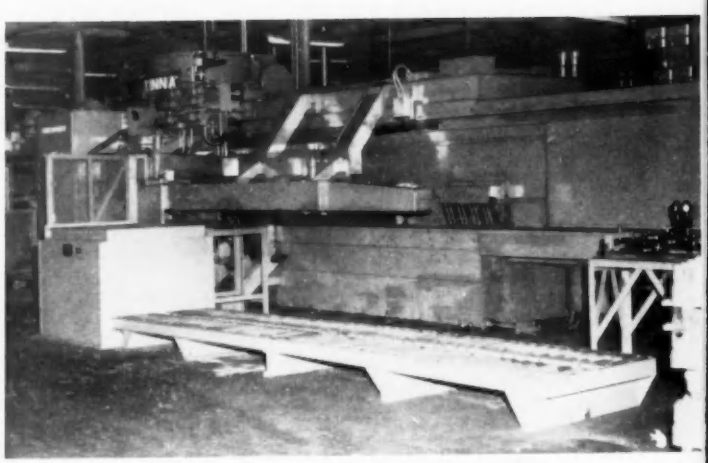
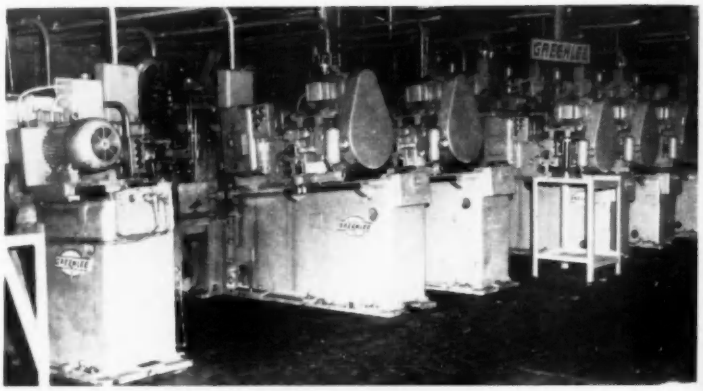
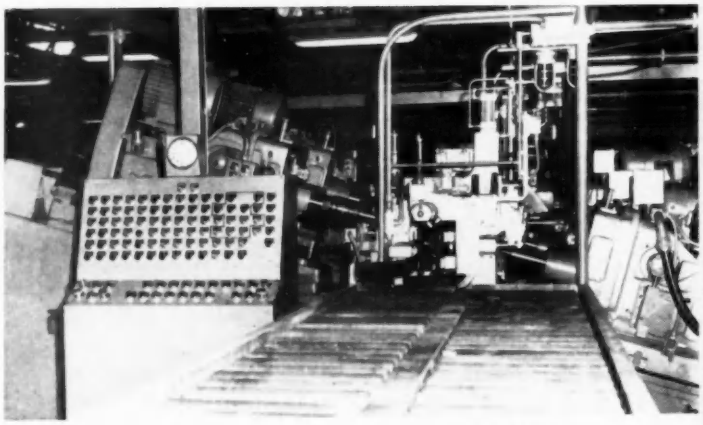


The big, horizontal Cincinnati surface broaching machine of four-station type which broaches the four plane faces of cylinder heads at the first operation on the line. Note the roller conveyor in the foreground, feeding rough castings to the Levelator at the left.



Perspective of part of the 17-station Greenlee transfer machine on the cylinder head line. It drills and reams reference holes; drills holes in top and bottom faces; drills and taps intake and exhaust manifold faces.



Looking into the loading end of the big 26-station W. F. & John Barnes transfer machine on the cylinder head line. It handles a large variety of operations, including drilling of intake and exhaust valve holes; open throats; milling of valve clearance holes; assembling of valve guides by means of a Gear-O-Motion attachment; gun-drilling of valve guides, etc.

Two New Aircraft Handlers Introduced in England

IN Berkshire, England, M. L. Aviation has brought out two aircraft handlers, one of which uses hydraulics for all tractive and lifting operations as well as starting its Diesel prime mover. The other handler rotates one of the plane's landing wheels—using the plane's weight for traction.

Figures 1 and 2 illustrate the aircraft handler which uses hydraulics for all tractive and lifting operations, including drive, brakes and steering as well as for starting the Diesel prime mover. The tricycle trolley grips the plane nose wheel with a pair of curved jaws that are tilted by hoist rams to raise it off the ground. All wheels are driven by individual piston-type motors fed from a variable-output swashplate pump controlling speed, braking and reverse.

Rear wheel hydraulics are bypassed when the unit is not loaded, leaving only the front drive in action. The operator guides the handler by the power-assisted tiller when walking, or may ride on a folding seat where controls are duplicated. Perkins P4 engine has a flame-proofed exhaust, and is coupled to the pump by a centrifugal clutch to ease starting and idling.

The Bryce Berger starter, independent of the main hydraulic system, is primed by a hand pump. The machine has a drawbar pull of 3500 lb and maximum handling load is 45,000 lb on a two-degree incline.

Fig. 1 — Aircraft handler which grips the plane's nose wheel with a pair of curved jaws

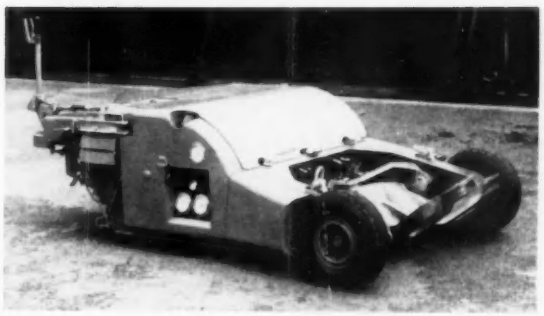
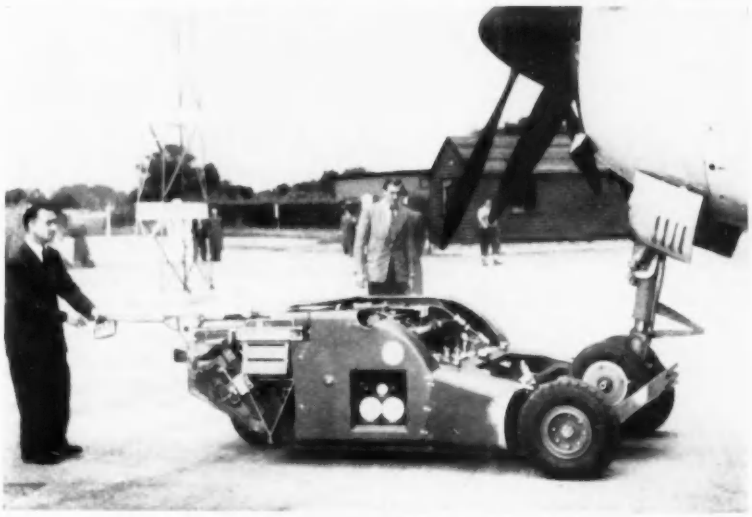


Fig. 2—This view shows a plane being moved by the unit which lifts its nose wheel



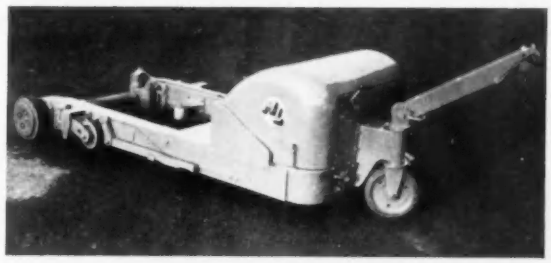
The compact aircraft handler shown in Figs. 3 and 4 is for maneuvering on carrier decks, runway aprons and in hangars. It rotates one of the landing wheels, thereby utilizing the plane's weight for traction.

The two friction rollers cradle the tire, the front one being hinged to permit the wheel to pass between the two forward arms of the trolley. As this roller is swung back and locked in place, the drive is coupled through an automatically-engaging dog clutch.

Rollers and front wheels are powered by a 10-hp Diesel engine via chains housed in the hollow arms. All controls including clutch, throttle and brakes are concentrated on the steering tiller. Top speed is 4½ mph and tractive effort 2000 lb. ■

Fig. 3—Compact handler which rotates one of the plane's landing wheels

Fig. 4 — All controls are located on the steering tiller of this compact handler shown maneuvering a plane



This is one of the special air-slide cars parked on the siding just outside the plant. The worker, seen here, is attaching the vacuum line which transports the dry resin to the storage unit.

Ford Plant Produces Millions of Yards of VINYL UPHOLSTERY

By Joseph Geschelin

DETROIT EDITOR

LATEST venture in chemical engineering by the Ford Motor Co. is found in the new Mt. Clemens, Mich., Chemical Products Plant, part of the Hardware and Accessories Division. This plant produces the vinyl upholstery materials used for interior trim items in Ford cars and trucks. The material is supplied in suitable rolls to the Ford Highland Park plant where interior trim cut-and-sew operations are established; also to outside suppliers of trim assemblies serving the Ford organization.

For 1959 production the Mt. Clemens plant shipped something over 6-million yards of vinyl upholstery material, and anticipates much larger volume for '60 models. While productive capacity depends upon many diverse considerations, it is quite possible that this plant could produce about double the yardage recorded for '59. At this writing it is making plans to handle a variety of some 250 combinations of color and grain to take care of '60 requirements.

Before getting into some of the details of the process employed here, it may be of interest to look at the major items of raw materials that go into the manufacture of vinyl-coated upholstery. First is the variety of cloth required for the various kinds of trim items. This cloth is obtained from a number of well

Close-up of the blender just ahead of the Banbury mixer. Here the operator is adding color dye to the mixture.

View of the Banbury showing the nature of the mass that is being digested and kneaded in the rolls.

known mills according to specifications. The next major raw material is ground vinyl resin, supplied by companies such as B. F. Goodrich, Bakelite, and others. This is received in special "air-slide" freight cars. In addition, they receive plasticizers in liquid form in tank trucks; pigments in drums, and other necessary chemicals.

Air slide delivery is a new development insofar as shipment of resin is concerned. It has been used for other kinds of materials and when the Mt. Clemens plant was in its initial planning stages, the management requested suppliers to study the feasibility of this method since it is more adaptable to large-scale automated operations and far more economical than the conventional way of shipping and handling in bags.

Each car holds about 100,000 lb of resin and serves as temporary storage on the siding. The material is withdrawn from the car by means of a vacuum line which transports it directly into a large overhead storage hopper.

The manufacturing process begins with the mixing of resin, plasticizer, and other ingredients in specified proportions to produce a dry powder which is then dumped into the Ribbon blender. This batch is thoroughly blended and delivered to the Banbury mixer. At this point more plasticizer is added as well as the pigmented color in liquid form, which the Banbury kneads and digests into usable form. At this point it is directly on the production line on the main floor.

Starting with the Banbury the flow of vinyl sheet material from one operation to another has its temperature maintained by steam heating the rolls.

From the Banbury the vinyl mix proceeds through a set of rolls for rough milling, then into another set of rolls from which the mix comes out in the form of a thick sheet. The sheet goes directly into the calender, a type of equipment with rolls arranged in the form of an inverted Ell. Here they employ large diameter rolls or drums with high temperature maintained. Since this is the most critical operation on the line, temperature control must be maintained accurately within a range of two-deg F. Because of this the drums are heated by means of water held

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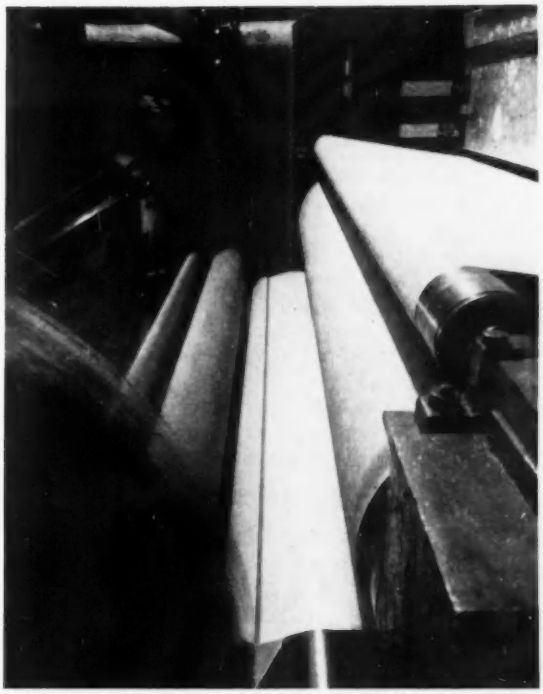
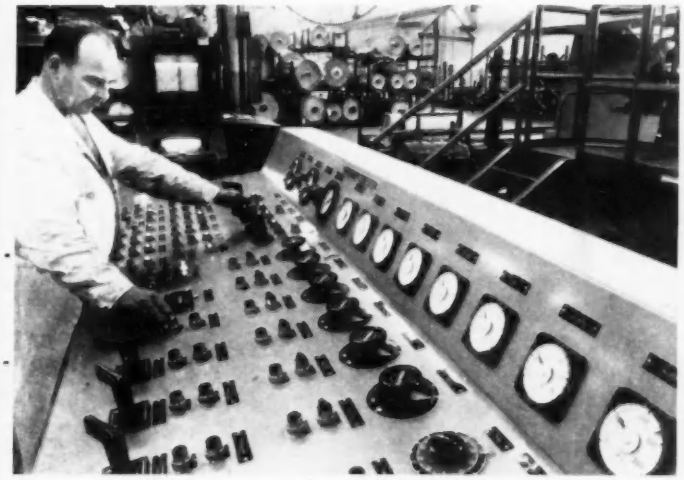
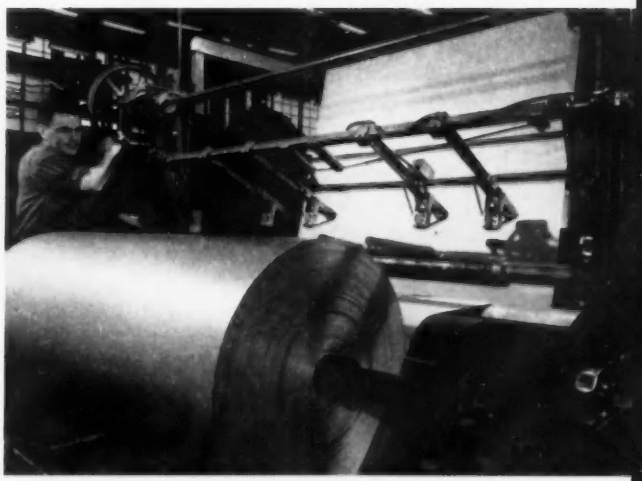


Looking into the complex of rolls in the laminating machine. Here the vinyl sheet is merged with the fabric to produce the vinyl-coated material.



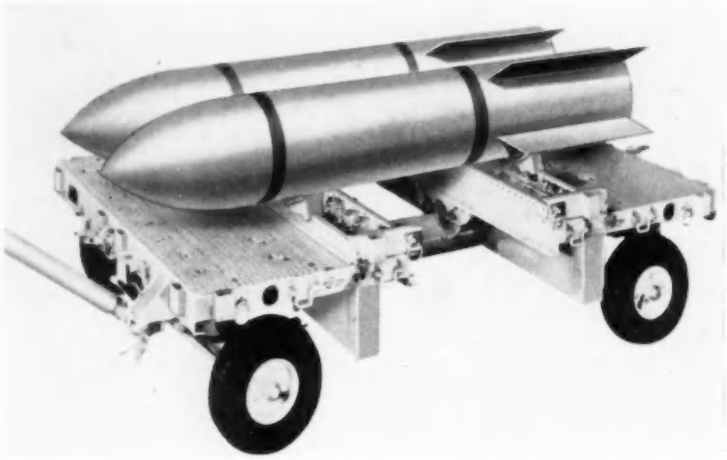
A portion of the Clark Control console with instrumentation for controlling operations on the main line.



Vinyl sheet is seen going through the calender. This is one of the most closely controlled stages of the entire process.

Missile Handling Trailer

of Lightweight, High-Strength Construction



Trailer shown with hatchways folded back and secured, fittings on the chockways holding two mock missiles or bombs in place for ready removal by the special lift truck, or other means.

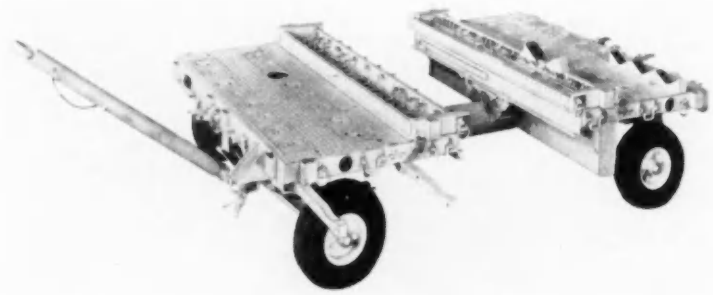
GOOD reliability must be designed into mobile ground handling equipment or full, tactical advantage of the missiles cannot be achieved. Such trailers represent careful design and precision manufacture. Since this type of unit will often be airborne, designers face strength/weight problems, and quality must be closely controlled. Previous experience in developing lightweight aluminum running gear, let United Manufacturing Co., Cleveland, into production of this type trailer for the Air Force Special Weapons Center, Air Research and Development Command.

Requirements for the MHU-12/M Atomic Bomb Trailer set capacity at 4000 lb, maximum width 7 ft and bed length 10 ft. Adapting devices, which gave the trailer multi-purpose utility, had to store under the trailer bed. Any conversions had to be simple enough to be made with gloved hands and without tools.

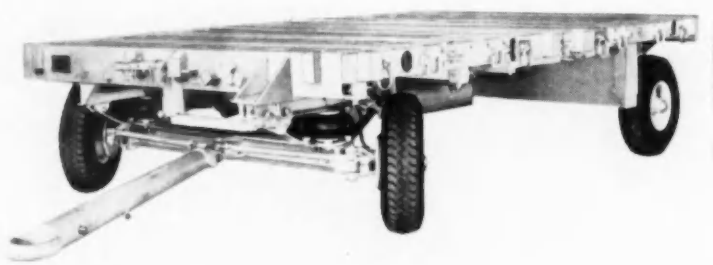
The trailer must work as a complete complement to the MJ-1 lift truck, which is a low, flat silhouette unit for elevating weapons into aircraft bomb bays. This called for a design with a slender midsection, to permit the lift truck to pick off or place one or more missiles on the trailer without rolling or further movement. When used by itself, the slender, or wasp-waist midsection had to be quickly changeable to a continuous flat bed.

DESIGN

The wasp-waist configuration posed an unusual problem in structural design and framing. Minimum interference for the boom of



Trailer shown with hatchways folded back and locked to front and rear decks, chockways running crosswise, providing strength as well as mounting for various chocks and tie-down fittings. Extended arms shown at lower center can be mounted as side rests for small weapons. Forks of MJ-1 lift truck can pass under entire width of load carried.



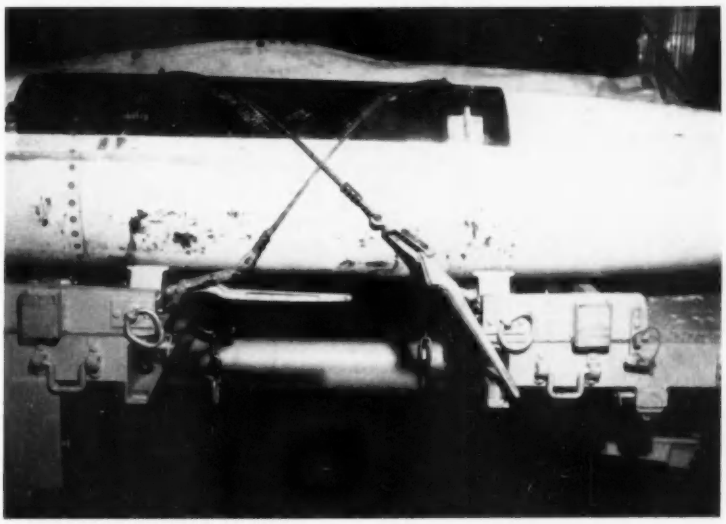
With hatchways folded into position, trailer becomes a flat bed cargo handling unit for use without the special lift truck.

the MJ-1 lift truck indicated a low, single beam as the only choice for tying front and rear halves of the truck. But to maintain a reasonably rigid, continuous deck when the hatchway doors were closed demanded a high degree of torsional and bending resistance in the main beam of the frame. An 8 in. alumimum pipe of Alloy 6061-T6 was selected for the main beam and deflections under full loads in adverse placement were kept below $\frac{1}{8}$ in. on all types of terrain.

Probably the most difficult design problem posed by the specifications was development of a simple means to support and secure the wide variety of special weapons, in position to suit the MJ-1 lift truck. This required the open center configuration, yet the unit had to support whatever load was required.

This design provides chock rails on the under sides of the hatchway doors, so that when the doors are hinged back and locked on the front and rear decks, the chock rails extend across the deck on either side of the hatchway. Neoprene-faced, aluminum chocks are mounted on the rails at charted locations, secured with quick-release pins that are chained to the doors.

Chocks, chock rails and tie-down slings must be capable of holding the load securely in place through a crash-landing. These universal tie-down slings are made of stranded steel rope, covered with nylon to avoid damage where they contact the bombs or missiles. Load binders, chain links, shackles and turnbuckles are also included in the slings, and all adjustments, adaptations, tensioning and releasing can be accomplished in a few seconds, without the aid of tools.



Trailers must hold load secure even through crash landings. In this case, load slipped slightly as shown by cable scratches on bomb in foreground and scuff marks on the loosened left cable mount. Rest of trailer passed test. On future runs cables will be anchored to base of deck instead of on the chockrail as shown, resulting in a firmer hold.

When the trailer is used as a flat deck cargo carrier, loads may be tied down to any combination of the 60 anchors provided on the deck and side rails. All of the anchor rings are flush with the deck when not in use but can be picked up and rotated to any angle as required by the tie-down pattern.

The deck is also provided with a pattern of holes on which several sets of neoprene-faced chocks may be mounted by inserting pins that are integral with the chocks into the holes in the deck. By this means, cylindrical stores of a wide range of diameters can be nested on the deck in one or two rows.

The lightweight aluminum running gear incorporated in this unit was developed by United Manufacturing over a period of six years, working with Wright Air Development Center.

All of the structural members in the deck and undercarriage are fabricated in the T4 or T6 condition. Welding is confined to places in the structure where the annealing that results from welding does not affect the strength of the assembly.

Most of the aluminum castings used are cast of 40 E Alloy. This is a self-aging alloy that requires no heat treating and which is very adaptable to welding. Some of the sub-assemblies require heat treating after welding to attain optimum strength, but the properties of castings which may be attached are not reduced by the heat-treatment.

United also agreed to produce, for the Air Force, a prototype in magnesium (without extra cost) to permit evaluation of a further weight reduction from the lighter metal. Plans and specifications available permit ordering trailers in either metal. ■

Quieter Cars Coming

Two automobile makers say quieter cars are coming in 1960 because of the use of tuned engine and body mountings.

Oldsmobile general manager Jack F. Wolfram says the 1960 Oldsmobile will use live rubber body mountings located at the nodal points of the frame. The result, he says, is minimum transmission of vibration and noise from frame to body.

The nodal points, or points of least vibration, were located by use of electronic equipment.

Chrysler Corp. will use unitized construction in 1960, thus eliminating the body mounting problem. But 1960 engine mountings have been tuned to balance engine vibrations against body and road vibrations.

Chrysler says that use of digital computers saved 165 years over the usual slide-rule methods. The problem involved finding the correct mounting locations, as well as mounting size and softness. ■

Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

By Kenneth Rose

As the steel strike comes to the two month mark, manufacturers of construction equipment have checked their stocks of the metal to see when shortages will become acute. They are among the larger users of steel plate, and most of them had laid in substantial inventories in advance of the strike.

Caterpillar Tractor Co. announced that it had sufficient steel on hand to permit full operations through Sept. 18. They were purchasing some steel from warehouses, officials reported. Operations might be affected by a settlement even before the Sept. 18 date, however, they said, as steel deliveries might not begin until two to four weeks after the end of the strike.

International Harvester Co.'s Construction Equipment Division is in the fortunate position of being able to get steel from Wisconsin Steel Co. Harvester's steelmaking subsidiary, which is not on strike. While the mill produces primarily bar and rolled forms, a deal seemed to be in the making to permit some trading of these rolled forms for flat stock from Ford Motor Co., whose steel mill is also operating. Harvester normally gets about half its steel from Wisconsin Steel Co. It can continue to operate at present levels through September, officials say, if its vendors can continue to make components. Harvester had asked its parts suppliers to build up a 50-day inventory before the strike, and they are now coasting on this.

Clark Equipment Co. reports that it is in good shape supplywise, with about a month's steel on hand. They went into the strike period with nearly 90 days' stock on inventory.

Koehring Co. reports that its position is satisfactory, with a supply of steel adequate for several months at present level of operations. The company had increased its inventory on high usage items of steel plate, and has been able to continue its normal practice of purchasing other items from warehouses as required.

Several other leading manufacturers reported that they had enough steel on hand "to see us through to the end of September without having to curtail operations seriously," and "enough to take us through September and into October." Officials of one company stated that because of the many kinds of steel they used, they did not have an accurate picture of the supply for all items. They were continuing operations, however.

It seems likely that, if the steel strike continues, the first pinch will come from the shortage of any of the purchased items that every manufacturer uses, or from a shortage of some of the specialty steels.

How Machinery Cuts Costs

A set of figures just released by the Bureau of Public Roads shows how earthmoving machinery holds down costs on highway construction. Price levels of component items, including excavation, surfacing, and structures, are given for two quarters of 1959, and one for 1958, with the 1946 price as 100. Here they are:

	1959 Second quarter	1959 First quarter	1958 Second quarter
Excavation	105.7	114.4	115.5
Surfacing	152.1	151.7	152.1
Structures—			
Reinforcing steel	167.4	171.2	173.7
Structural steel	160.5	165.2	169.3
Structural concrete	133.8	141.6	141.4

It seems that the component item that has shown the smallest change since 1946 is excavation, and that the greatest increase has been in steelwork. It is worth noting also that the greatest drop in cost of component from 1958, second quarter, to 1959, second quarter, is again excavation, with a decrease of 8.5 per cent in the price index. While the cost of highway construction in 1959 second quarter dropped 2.7 per cent, the largest quarterly decrease since 1954, it is obvious that the earthmovers and their modern tools have led the cost-cutting parade.

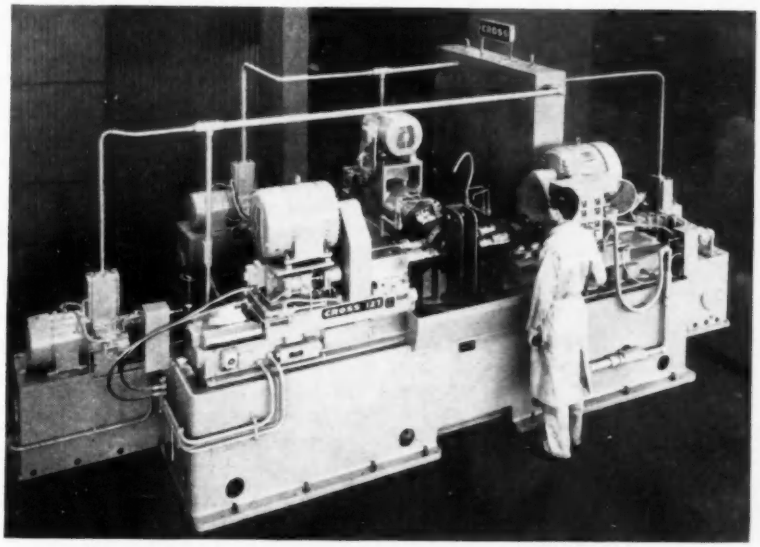
Interstate Highway Progress

As of the first of August, 1959, a total of 4212 miles of the Interstate Highway System had been completed since the program began in July 1, 1956. The cost of this construction was $1.44 billions. Construction was underway on an additional 5260 miles of the system, at an estimated cost of $3.29 billions, according to Federal Highway Administrator Bertram D. Tallamy. Preliminary engineering work and acquisition of right-of-way since the beginning of the program has accounted for an additional $2.10 billions, spent or authorized.

Construction contracts awarded during July, 1959, were for 172 miles of road in the Interstate System, at a cost of about $97 millions. Preliminary engineering to the extent of about $6 millions, and right-of-way acquisition estimated at $124 millions were authorized during the month. The month saw the completion of work on 156 miles, at a cost of $94 millions. ■

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue



Precision Boring and Cross-Facing Machines

Pictured are three new precision boring and cross-facing machines used to solve varying output problems in the production of various truck differential housings. Able to meet accuracy requirements for machining in-line differential bores, pinion and pilot bores, and several cross shaft bores, each unit is quickly adapted to handle any of the parts. Depending on part design, output on each 3-way machine ranges from 17 to 24 carriers per hour. (The Cross Co.)

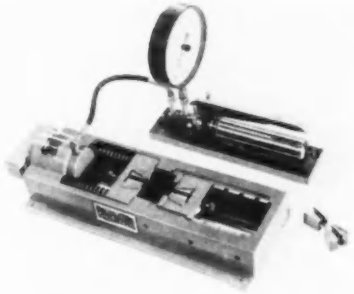
Circle 30 on postcard for more data

Portable Tensile Testers

PORTABLE tensile testers for bench or wall mounting have been developed to perform standard tensile tests when mounted horizontally and either tensile or compression tests when mounted vertically. A lower compression plate is available as an accessory when compression tests are anticipated.

Tensile load is applied to the test piece by manually operating the hydraulic pump. The applied load is shown directly on the 8½ in. diameter gage.

Designated the PT series, these testers are available in two general sizes. Model PT-20 units have capacities from 5000 to 20,000 lb. Model PT-40 units have capacities in excess of 20,000 lb up to 40,000 lb. Several sizes of flat and round jaws are available for specimens up to ½ in. in thickness or ¾ in. in diameter. All testers have a maximum stroke of 2½ in. *Steel City Testing Machines, Inc.*



Steel City Model PT-40 portable tensile tester

Circle 31 on postcard for more data

Precision Cutting Unit

DESIGNED for work on non-ferrous metal parts, a precision multi-spindle drilling, boring, reaming, and tapping machine equipped with quick-change heads that require no gearing to drive the work spindles has been designed by the *Sundstrand Machine Tool Div. of Sundstrand Corp.*

Two sizes of the machines are being made available, offering either an 18 by 36 in. head or a 9 by 14 in. head. Both sizes of machines can have heads changed completely in 15 to 20 minutes. Similar parts with different holes can be accommodated by providing additional spindles which can be fitted with a tool as required.

A feature of the units is the machine spindle drive that is said to eliminate the need for any type of gearing in the heads.

Circle 32 on postcard for more data

Electric Hydraulic Press

ENGINEERED to handle heavy-duty jobs requiring pressures up to 150 tons, a motorized hydraulic press has been designed to withstand rough treatment and abuse.

Frame members are fabricated from high grade structural steels. The frame assembly is of all-welded construction for maximum rigidity and minimum deflection. All corners have been coped and ground to eliminate sharp edges. Its ram, made of bar stock 820 steel, is heat treated and ground to obtain a 16 micro-inch finish. *American Chain & Cable Co., Inc.*

Circle 33 on postcard for more data

Facing Heads

THREE new Davis continuous-feed facing heads for small-diameter boring, facing, turning, counterboring, backfacing, grooving, and chamfering operations feature uninterrupted radial feed and high accuracy.

Designed for use with all types of rotating spindle machines, they cover a range of diameters from 7/16 to 25 in. Cutting diameter is controlled by the operator or by adjustable feed stops which may be preset to required diameters. Radial feed is adjustable to 0.0001 in., or finer. *Davis Boring Tool Div., Giddings & Lewis Machine Tool Co.*

Circle 34 on postcard for more data

High Volume Automated Precision Boring Machine

Ex-Cell-O precision boring machine with an automatic loading mechanism that transfers assemblies to the machine chuck. Here a finish precision boring operation is performed on the bushings, before the parts are automatically unloaded and passed to a gaging station at the rear of the machine.

THIS Style 112-D precision boring machine handles over 260 automobile transmission parts every hour. The automatic cycle includes assembly, loading, precision boring, and unloading.

An assembly unit mounted at the front of the machine presses a bronze bushing approximately 2¼ in. in diameter into the cast iron body of the component. The bushings are gravity fed from a hopper, while the cast-iron bodies as received from a conveyor are rolled into the assembly station, again by gravity. The bushings are pressed hydraulically into the bodies and two body-and-bushing assemblies are completed at each cycle of the machine. *Ex-Cell-O Corp.*

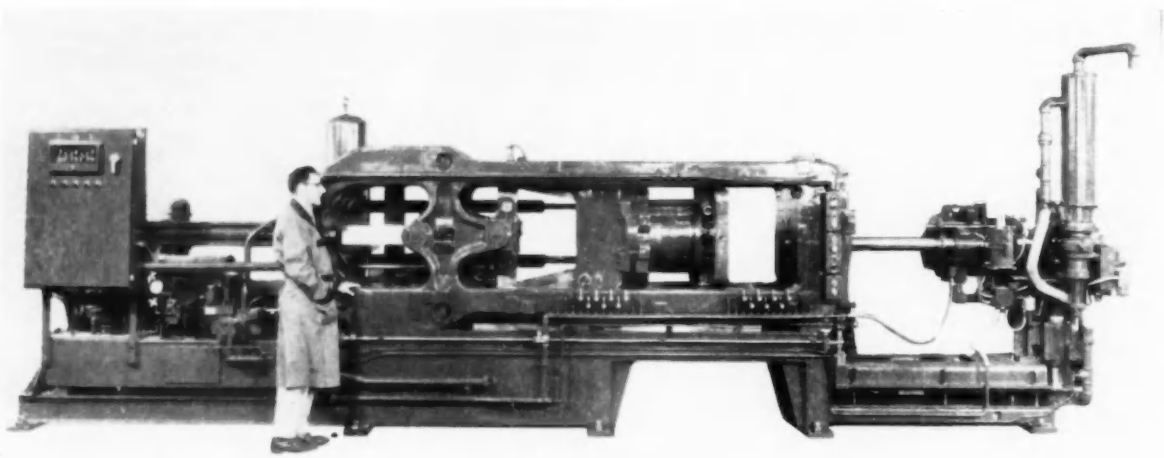
Circle 35 on postcard for more data

Universal Milling Machine

AN extra-heavy, extra-long table designed to offer a large working surface plus good stability, is one of the features of the Grant Model AFU-3 universal milling machine.

The center of gravity of the table, despite its 40 in. of longitudinal travel and 63 by 14 in. of working surface, is said to never extend beyond its bearings. Weighing nearly 10,000 lb, it includes a double round overarm and is equipped with dual operating controls—one set at the front of the machine and one at the rear. Totaling 12½ hp, two motors—one for the spindle drive and one for feeds and traverses are incorporated. Offering a range to meet practically any production problem, 18 spindle speeds and 24 feeds are available. *S & S Machinery Co.*

Circle 36 on postcard for more data



Lester-Phoenix 450 ton die caster for deep draw parts has a movable platen, completely unobstructed, 38 in. wide by 40½ in. high

Aluminum Die Casting Machine For Deep Drawn Parts

AN aluminum die casting machine, called the HP-450X-SF, delivers 450 tons of clamp, while providing a die opening stroke which is adjustable from 8 to 30 in.

The machine will produce deep draw aluminum parts such as rotors with long shafts, and automobile transmission housings weighing up to 16 lb.

Incorporating the Lester pre-fill injection system which provides high initial speed with high final impact, the machine has a maximum die height of 30 in., adjustable to a minimum height of 8 in. The complete machine cycle at the 8 in. die opening adjustment is 6.7 seconds, and at the 30 in. adjustment is 8.5 seconds. The stroke of the injector plunger is 17½ in. The injection shot end of the machine is adjustable from center to 6 in. below center, with the height controlled by an hydraulic elevating device. The support bars of the injection end are level for automatic ladling adaptations. Both the shot pressure and shot speed are easily adjustable. *Lester-Phoenix, Incorporated.*

Circle 37 on postcard for more data

Drilling-Reaming Machine

MACHINE No. 1282 is a five station automatic drilling and reaming unit which is being used for drilling and reaming four 0.094 in. diameter holes in automobile starter clutch housings. The drilled and reamed holes are located 90 degrees to each other. In order to do all drilling and reaming on these holes, the fixtures are automatically indexed 180 degrees between stations to present holes to be machined in proper relationship to the drill and ream spindles.

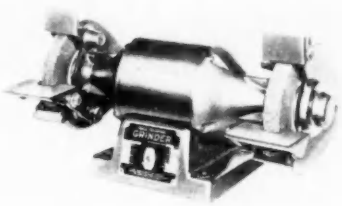
Machine cycle, including indexing, is accomplished in eight seconds. *Rehnberg-Jacobson Mfg. Co.*

Circle 38 on postcard for more data

Bench Grinders

FIVE models of bench grinders, each equipped with an a-c induction motor, one five grit wheel, one medium grit wheel, and tool rests, have been designed by *Porter-Cable Machine Co.*

The heavy-duty grinders feature all ball-bearing construction, improved



Porter-Cable bench grinder

spark breakers, maximum wheel guard protection, large dust chutes, and wide base with rubber mounting cleats. The U-shaped tool rests are fully adjustable and may be tilted from 0 to 60 degrees without loss of wheel clearance.

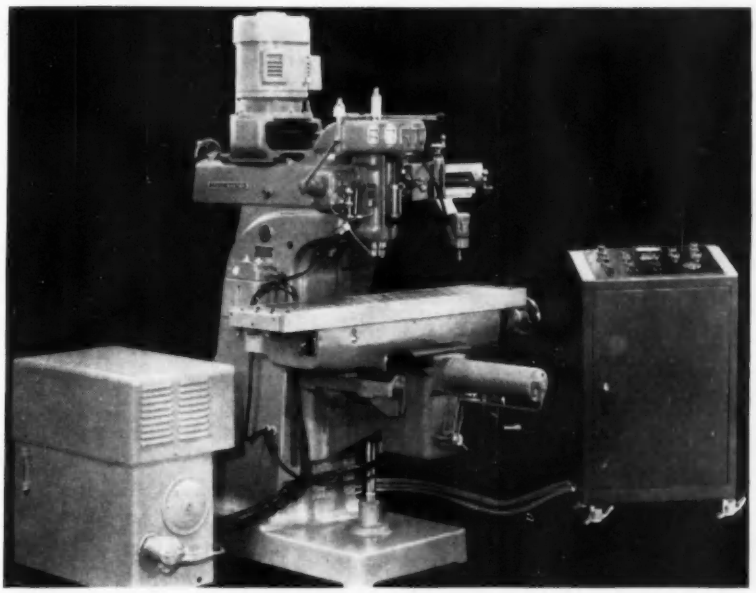
Circle 39 on postcard for more data

Eight Station Machine

CAPABLE of 19 separate operations on forged steel connecting rods, a special eight station machine operates on a 25 second cycle producing 144 parts per hour. A series of four duplicate machines, all having interchangeable tooling, enables the processing of 10, 18, 25, 35, and 50 hp connecting rods.

Bushing plates are designed for quick removal, and the use of standard adjustable drill heads with quick-change spindle positioning plates allow these units to be changed over from one size connecting rod to another in less than four hours. *Wisconsin Drill Head Co.*

Circle 40 on postcard for more data



Gorton three-dimensional milling machine for fast, accurate profiling with automatic tracing

Milling Machine Features Electro-Hydraulic Tracing

THIS Gorton automatic milling machine features a small, compact, cartridge type tracer head with one electrical cable. No heat is generated within the tracer head and no normal variation in room temperature will affect its proper functioning. Only one moving part in the tracer head, subject to minimum pressure, assures long life and trouble-free service.

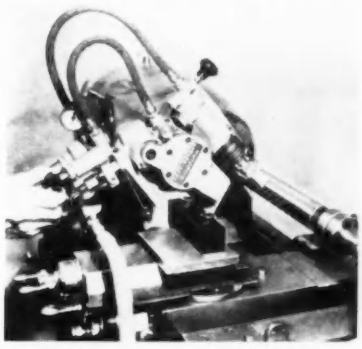
The tracer does not depend upon magnetism nor electric conductivity to hold it in contact with the master. Therefore, any suitable master material can be used, such as plastic, wood, ferrous and non-ferrous metals. The tracer will follow the master—male or female—in either direction. No drive mechanism is required to rotate the stylus.

This system makes possible exceptionally slow feed rates whenever required. This is an advantage when small cutters are used and deep cavities are being profiled, or where the machining of tough materials is required. *George Gorton Machine Co.*

Circle 41 on postcard for more data

Finishing Process

A NEW finishing process called Microstoning is an abrasive process that generates a controlled microinch finish on practically any material and corrects geometric errors caused by previous machining operations.

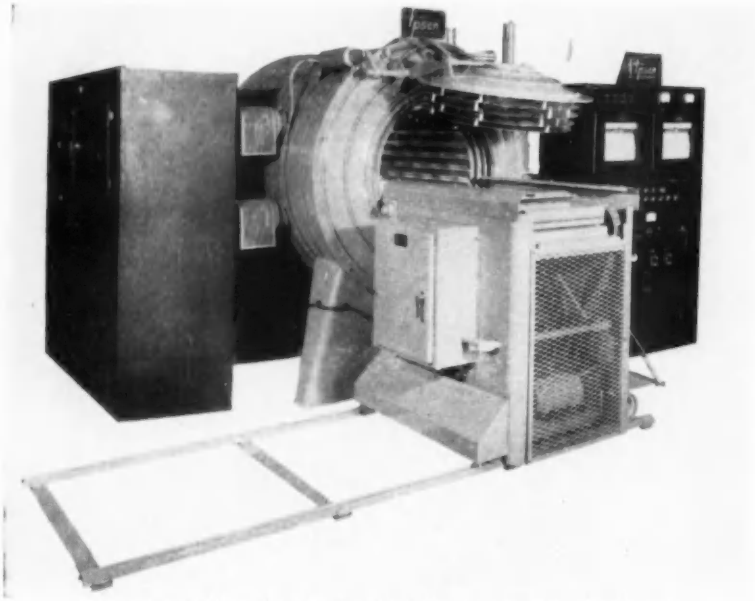


Taft-Peirce Microstoning attachment

Microstoning is accomplished by using a Supfina machine tool attachment. The attachments are generally used on engine lathes, although equally well adapted to vertical turret lathes, boring mills and planers.

In operation, a specially designed Supfina abrasive stone is held against cylindrical work mounted between centers. The stone oscillates at a preselected amplitude against the rotating workpiece while the lathe saddle is power-fed along the work axis. The stone removes the amorphous skin and other imperfections left by previous machining and imparts a fine finish to the base metal. *Taft-Peirce Mfg. Co.*

Circle 42 on postcard for more data



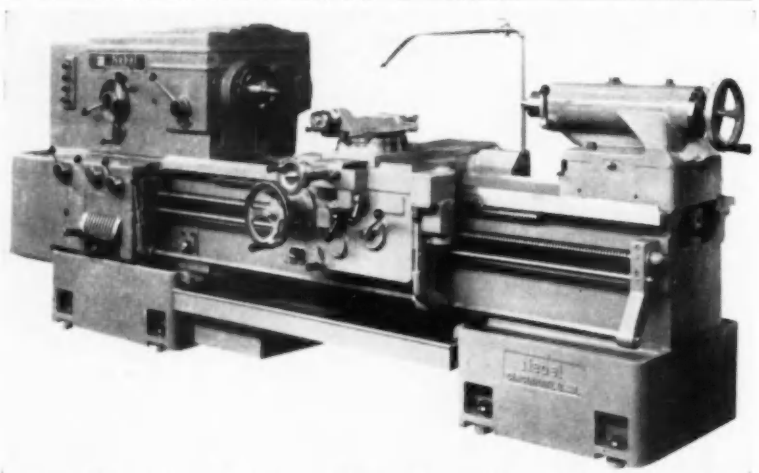
Ipsen automatic Series V 300 automatic high vacuum heat treating furnace

Automatic High Vacuum Heat Treating Furnace

AN automatic high vacuum cold wall type furnace with a work space 24 in. wide, 36 in. deep, and 12 in. high; operating pressure of 1 micron Hg; input of 75 kw; operating temperature of 2275 F has been designed.

This vacuum heat treating unit is specially adaptable for copper and for nickel brazing of flat stainless assemblies. High vacuum reduces surface tension of the brazing alloy which eliminates crevice formation and corrosion normally associated with atmosphere or hydrogen brazing. Flat assemblies are heated sandwich style from above and below for uniform heating, reducing the danger of overheating outside edges. Other uses of the V-300 furnace include hardening, tempering, drawing and annealing refractory metals, reactive metals, stainless and special alloy steels. *Ipsen Industries, Inc.*

Circle 43 on postcard for more data



Nebel heavy duty engine lathe provides precision machining at high spindle speeds

Heavy Duty Engine Lathe Provides Precision Machining

MODEL HD 2516 heavy duty engine lathe offers precision machining capabilities for turning and facing a wide variety of heavy duty work.

Selected from a direct reading color index are 18 gear driven speeds —easily controlled by two levers and color keyed speed plates. Speeds up to 1500 rpm are available with selective gear design engaging only the gears required. The headstock provides wide-faced, shaved and hardened gears, with short, heavy, multi-splined shafts mounted on anti-friction bearings.

Automatic lubrication is provided for the headstock, quick change gear box and apron. An externally mounted pump and motor supplies pressurized lubrication to all headstock bearings, and automatic oil spray to all rotating parts. A cascade oil system supplies the quick change gear box, while end gearing is totally enclosed in a self-lubricated housing. All apron gears are lubricated from an oil reservoir. A one-shot system lubricates carriage ways, cross slide, bed ways and other parts external to the apron. *The Nebel Machine Tool Corp.*

Circle 44 on postcard for more data

Power Punch Press

THE Allen Model BT-8 eight ton press has a die space of seven inches shut height and five inches throat depth. It can be easily set up for any standard punch press operation, such as blanking, forming, shearing, riveting, drawing, punching, crimping, etc., in such materials as metal, fiber, and plastics.

Available in either bench or floor model, the BT-8 is equipped with a single pin, knife type clutch and can be easily changed from repeat to non-repeat action. Adjustable V-type ram gibs and an adjustable ram are among other features of the new model.

Crankshaft diameter at the main bearings is 1½ in. and the die bed is 7 by 12 in. with an opening in the bed of 4 by 6 in. A 115 lb, 16 in. diameter, 3 in. face flywheel assures ample power for the standard 1½ in. stroke. The unit utilizes a ½ hp motor. *Alva Allen Industries.*

Circle 45 on postcard for more data

Standard Seam Welders

A NEW line of standard seam welders is available in three sizes ranging from 50 to 400 kva, inclusive. Each size is available as a circular, longitudinal or universal machine in a range of standard throat depths and transformer sizes. *The Federal Machine & Welder Co.*

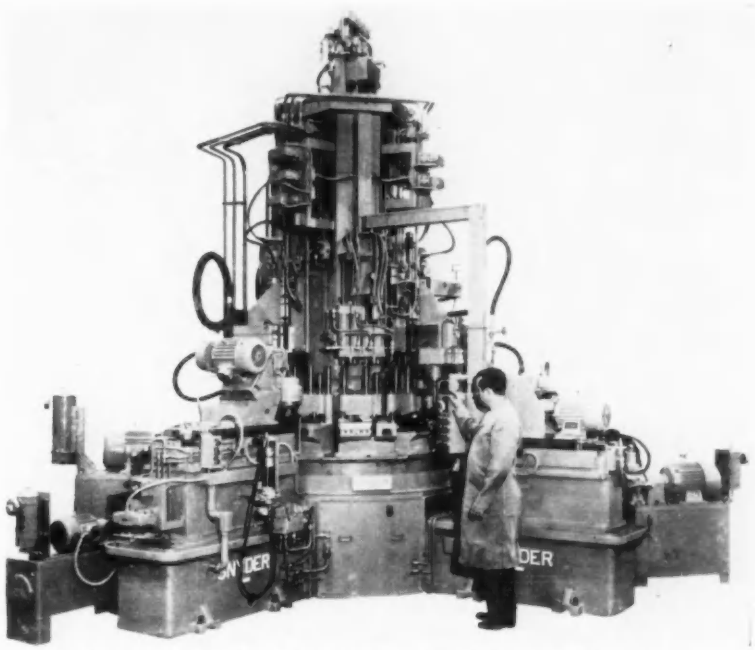
Circle 46 on postcard for more data

Sixteen Station Center Column Machine

MILLING, drilling, spotfacing, and tapping operations are performed by this special 16 station center column machine on six different cast iron fuel pump covers. The machine is also designed to produce aluminum parts. Production rate is 81 cast iron parts per hour at 100 per cent efficiency.

The difference in the six parts lies in the number and location of holes in each part. To handle these parts with minimum changeover time, a method of using multiple-spindle drill heads that provide spindles for drilling all of the holes in the six different covers, has been developed. Thus, to change over from one part to another, merely insert or remove tools from certain spindles. Speed and feed change gears or V-belt pullies in the units accommodate change from cast iron to aluminum parts.

The machine has a 56 in. diameter cast iron index table mounted on cartridge-type roller bearings and driven by a fluid motor and bullgear arrangement to hydraulic shot bolt index positions. The base is a welded steel construction that supports the center column. A manually-operated central lubrication system is directed to all sliding and rotating surfaces in the machine. *Snyder Corp.*



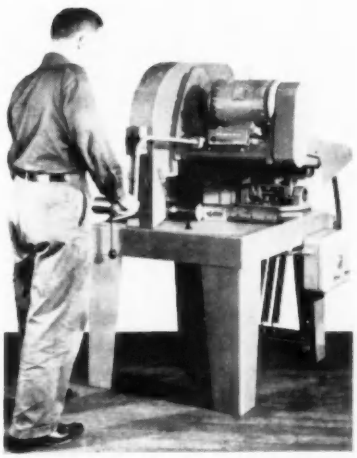
Snyder center column unit performs drilling, milling, spotfacing, tapping

Circle 47 on postcard for more data

Dry-Abrasive Cutting Unit

THIS large capacity dry-abrasive cutting machine, designated as the Model 2-A Sever-All, is designed for heavy-duty work in metal-working plants, steel mills, factories, etc. It has the capacity to cut practically all metals including cold and hot-rolled steel, alloy and carbon steel, stainless steel, cast iron and non-ferrous metals up to 4 in. solids, round or square: 5½ in. OD pipe or tubing; 6 by 1 in. flat stock; 6 in. angle iron; and 8 in. channels.

It is an oscillating type abrasive cutting machine to which work is manually fed. Power driven wheel oscillation enables it to sever large cross-cut sections of material with a fine quality of cut. *American Chain & Cable Co., Inc.*



American dry-abrasive cutting machine

Circle 48 on postcard for more data

Portable Broaches

AVAILABILITY of 28 portable broaches, designed to solve high production machining problems demanding maximum stock removal, along with a fine surface finish, has been announced.

The new broaches incorporate a segmented helical pattern of cutting teeth to generate the full diametrical cut. They are followed by a series of closely pitched teeth to produce a fine surface finish. *California Broach Co.*

Circle 49 on postcard for more data

Roll Finishing Machine

DESIGNED for small volume finishing of parts such as screws, washers, delicate gears, and instrument parts, the new Techline roll finishing machine is available in six basic models —also in larger, special sizes. The octagonal-shaped barrels are set on rollers powered by a ½ hp, 110 v drive. The drive is enclosed in a molded fiber glass housing for maximum operator safety.

Barrels are of neoprene which is resistant to oils, greases, and most chemical solutions. They are steel-reinforced and have a heavy gage sheet steel end door with a molded neoprene gasket for positive, leakproof sealing. *Techline Div. of Wheelabrator Corp.*

Circle 50 on postcard for more data

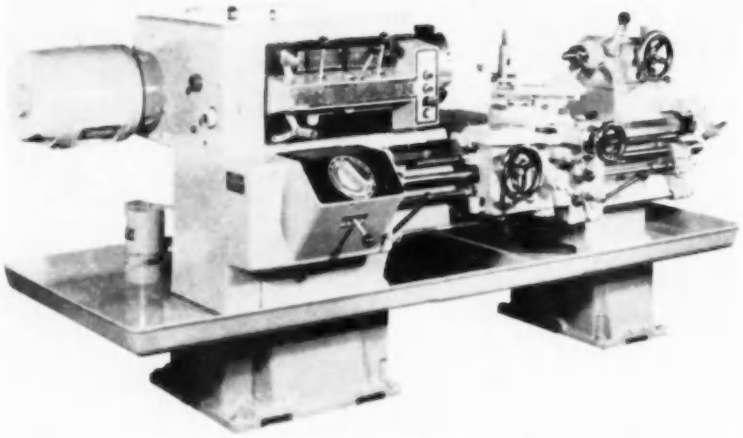
Drill Grinder

THE Farrel-Sellers 1 G-A drill grinder is a self contained bench type unit. It will grind either straight or tapered shank, right-hand, 2-lip twist drills in sizes from No. 70 to 1 in. diameter, to any included angle of point from 60 to 150 degrees.

The unit weighs approximately 130 lb and bench space required is 17 by 19 in. Height is 12 in. *Farrel-Birmingham Co., Inc.*

Circle 51 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



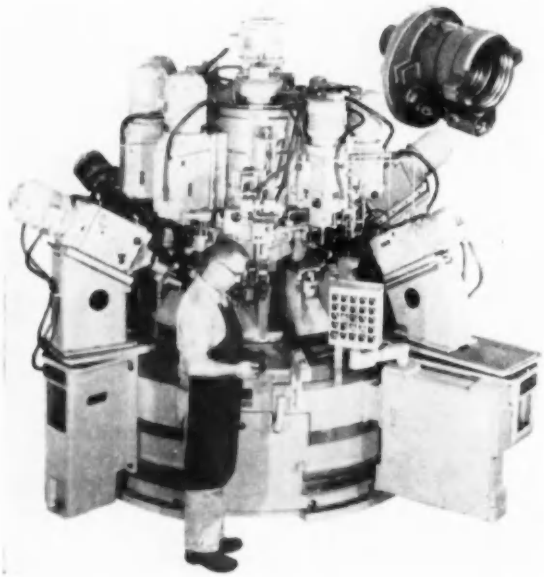
Clearing-Axelson re-designed heavy duty engine lathe features many important changes

Re-Designed Heavy Duty Engine Lathe

MAJOR modifications have been made on standard Series 2013 Clearing-Axelson engine lathes. Changes in the lathe line include boosting the motor horsepower, increasing spindle speeds and enclosing the gear box. The new machines also feature hardened and ground headstock gears, bedways, and cross feed screws. The bedways are made of tool steel and are replaceable. The apron is of double wall construction and encloses all gears except the rack pinion with an oil-tight housing. The enclosed gears are automatically lubricated.

The swing over the bed is 22½ in. Swing over the carriage is 13¾ in. *Clearing Div. of U. S. Industries.*

Circle 52 on postcard for more data



Kingsbury multi - unit automatic. At each station the machine has provision for either coolant or air blasts to remove chips. Just before the drilling of the two small diameters, special air blasts blow out all the chips, using tubes that are moved right into the holes by air cylinders.

Multi-Unit Automatic Performs 12 Operations

THIS multi-unit automatic machine with center column performs 12 operations on pump housings for power steering units. Twelve units drill, counterbore, spotface, chamfer, ream and tap at a gross production rate of 325 parts per hour.

A 63 in. index table holds 10 work fixtures with power clamping and automatic unclamping. Each fixture holds one part with its axis vertical and the large bore up. The operator loads it by holding the work in approximate position with one hand and swinging a shelf under the work with the other. *Kingsbury Machine Tool Corp.*

Circle 53 on postcard for more data

Stationary Die Swager

A STATIONARY four-die swager has been added to a line of metal forming equipment. The swager is suited for use whenever it is desireable to keep work from rotating, such as swaging a rectangle from a round stock. It will also swage other conventional pointing and forming operations from rounds. *The Fenn Mfg. Co.*

Circle 54 on postcard for more data

Multi-Spindle Nutsetters

Three different multiple-spindle nutsetters for use in automotive assembly operations have been designed. Pictured is a 614NS-4 nutsetter for assembly of differential carrier covers. The unit employs six 14NS-4 air motors. (Cleco Air Tools.)

Circle 55 on postcard for more data

Projection Welder

A SINGLE - PHASE projection welder that will produce welds meeting the most severe requirements has been developed. The unit has a device for the automatic control of the up and down slope of the welding current, and provides the exact heat cycle needed to produce the strongest type of welds, according to the manufacturer. *Universal Electroweld Div., Electric Arc, Inc.*

Circle 56 on postcard for more data

Gaging Device

THE Indi-Ron is an instrument specifically designed for precision out-of-round, concentricity, and squareness measurements.

The part is rotated while the gage head remains stationary; the reference point is the axis of the spindle on which the part is held. The spindle has an accuracy, both rotational and axial, which is said to be guaranteed to three millionths, or less.

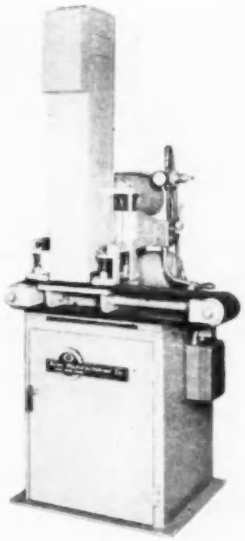
With the part centered and aligned, a trace (or traces) is made on the polar coordinate graph recorder which is synchronized with the spindle. A true "picture" of the part is thus obtained. Standard turntable capacity is six inches and weight load is 75 lb. Normal spindle speed is 4 rpm. *Cleveland Instrument Co.*

Circle 57 on postcard for more data

Grinding, Polishing Unit

MODEL JC abrasive belt finishing machine is for performing flat grinding, deburring and polishing operations. It is equipped with a six inch wide abrasive belt and will handle parts up to three inches thick.

A motorized conveyor belt carries the work under spring-loaded hold-down rollers and the belt contact wheel. Multiple head assemblies can be mounted in tandem along one long conveyor belt to perform high production progressive finishing operations.



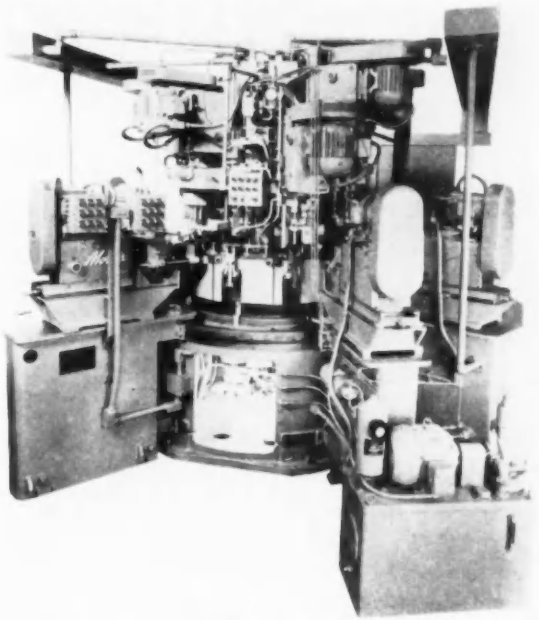
Acme low-cost grinding, polishing machine

These heads can also be mounted on a bench or used in conjunction with rotary tables.

The unit has a working height of 34 in. It occupies a floor space about 24 by 30 in. Feed range is from 15 to 60 fpm. *Acme Mfg. Co.*

Circle 59 on postcard for more data

Horizontal Rotary Indexing Machine



Morris Model 394-8 high production machine. There is no welding or fabrication involved in the machine's one - piece cast iron base, increasing rigidity. All machining is dry, without coolant.

FORTY-ONE operations are performed automatically on compressor heads by this high production machine, Model 394-8. The machine uses a 48 in. diameter table and a 10-station automatic hydraulic index to drill, ream, spotface, chamfer, and mill 375 pieces per hour.

Operation is completely automatic. Each of the standard Morris units has independent feeds and speeds, permitting adjustment without affecting the entire machine. The compact camfed drill units offer automatically controlled operation cycles, adjustable thrust control, and a wide range of speeds. *Morris Machine Tool Co.*

Circle 58 on postcard for more data

Machine Mounts

DESIGNED to control vibration and shock and to eliminate the need to lag-down production machinery, a line of industrial machine mounts incorporates built-in level control features. The line comes in three standard sizes to handle load ranges to 8000 lb each. *Consolidated Kinetics Corp.*

Consolidated industrial machine mount

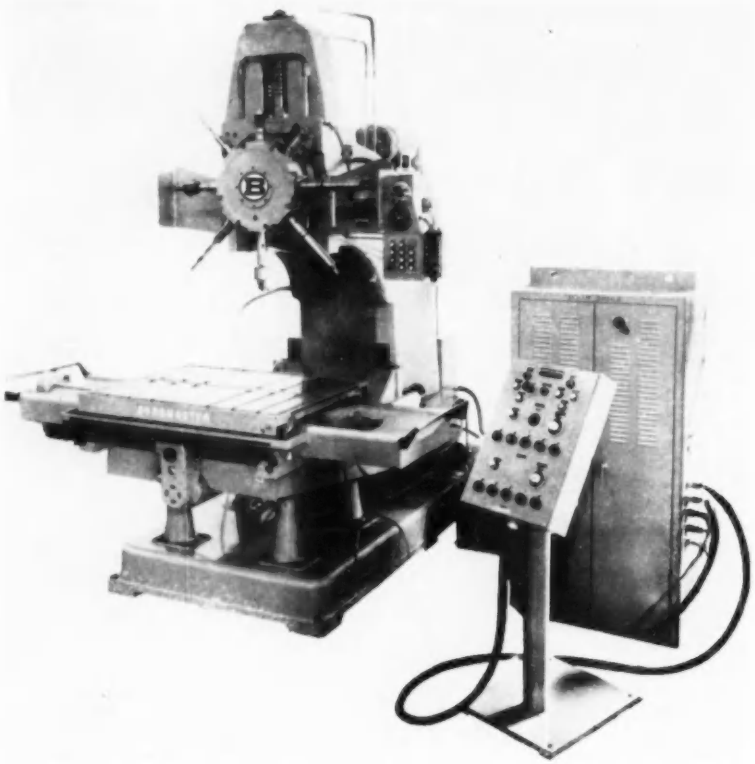
Circle 60 on postcard for more data

Lightweight Generator

THE Ther-Monic Model 150 2 kw output generator has a frequency rating of 450 kc nominal, but other frequencies are available on request. Typical uses include hardening, brazing, soldering, forging, and annealing.

Model 150 weighs about 250 lb and measures 28 by 19 by 21 in. high. Power input is 220 v-ac, 60 cycles, single phase, 21 amp, 460 VA, with a 90 per cent power factor. Rated in accordance with NEMA standards, power output is 114.0 Btu per minute, 2 kw at 450 kc. The unit has no moving or rotating parts except a 200 CMF blower. *Induction Heating Corp.*

Circle 61 on postcard for more data



Burg Tool Mfg. Co. automatically temperature compensated hydraulic feed control for Burgmaster automatic turret drilling machines

Temperature Compensated Hydraulic Feed Control

THE *Burg Tool Mfg. Co.* announces an improved hydraulic feed for their Models 2 BH and 3 BH machines. The new system compensates for temperature variations that normally affect feed rates when hydraulic systems are employed. The temperature-compensated oil flow control will maintain constant feed rates under normal operating conditions.

Feed rates can be dial calibrated and a setting can always be maintained reliably. Actual feed rate corresponds with feed rate setting; that is, the desired rate of feed, within normal temperature ranges. No hydraulic warm-up time is required.

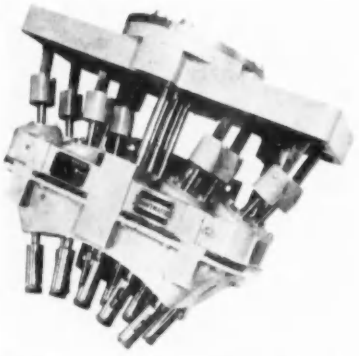
Circle 62 on postcard for more data

Drillhead

SHOWN is a recently built special fixed center, ball bearing angular type drillhead. The device drills holes at an angle at the same time straight holes are being drilled parallel to the direction of machine feed. The ten spindles are equally spaced in two straight rows. To permit drilling of all holes radially, each pair of spindles is at an 11 degree angle with the adjacent pair. An included angle of 44 degrees exists between the pairs of outside spindles.

In operation, the main body of the head remains stationary with the spindles being fed into the work through linkage by the upper casting attached to the drilling machine. To provide adequate support, the head contains two guide rods and a machined pad. *Thriftmaster Corp.*

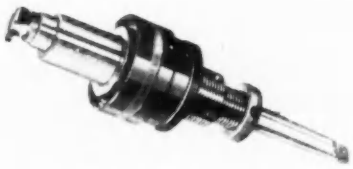
Circle 63 on postcard for more data



Thriftmaster drillhead drills angle and straight holes at the same time

Feed Recessing Tools

A NEW line of feed recessing tools features interchangeable parts to increase work range. Designed for use on standard drill presses, radial drills, and special machines, the units eliminate the need for complex tooling in performing relieving, grooving, chamfering, backfacing, counterboring, necking and boring operations. Two basic types and seven standard

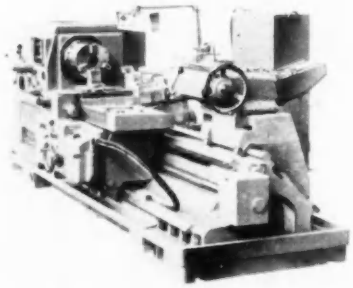


Scully-Jones automatic recessing tool

sizes cover work hole diameters from ¼ to 4½ in. and offer up to 0.300 in. depth of cut. *Scully-Jones & Co.*

Circle 64 on postcard for more data

Threading Machine



This Cri-Dan type "FT 80" machine incorporates the advantages of an automatic or automatic cycle threading and machine. With a double bed, semi-automatic or automatic cycle threading and tracing in one operation is possible. The unit is for use in all shops engaged in medium and heavy production on pipe work. (Gisholt Machine Co.)

Circle 65 on postcard for more data

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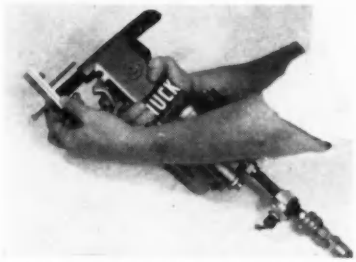
Self-Broaching and Self-Sizing Fasteners

Designed to automatically produce optimum interference-fit installation, a new line of self-broaching, self-sizing Huckbolt fasteners has many applications in aircraft and missile



fabrication because of the leakproof joints and improved structural rigidity it affords.

Both the self-broaching and self-sizing designs have the same shear and tension values as close-tolerance Huckbolt fasteners of equal diameter in AISI 4037 material.

The new fasteners are installed by a technique known as "double-driving." This consists of first pulling the pin through the hole into an interference fit; the collar is then applied and the installation completed by automatically swaging the collar into locking grooves on the pin. The tail end of the pin, which contains pulling grooves for the tool to grip, is then automatically broken off and discarded. *Huck Mfg. Co.*

Circle 70 on postcard for more data

Hydraulic Valve

A hydraulic valve that can be opened or closed within three-thousandths of a second for applications in rocket launching, fire fighting, and nuclear reactors, is being produced by *Bendix Aviation Corp.*

The valve diameter is no larger than the pipeline or piston on which it is mounted. There is no stem-and-wheel branching up from the valve. It is tubular, and its "mouth diameter" can be designed from ½ to 36 in., or more. The valve can be remotely actuated by electrical, electronic, hydraulic or pneumatic controls. Its pressure capabilities range up to 12,000 lb psi.

Circle 71 on postcard for more data

New Tire Valve Core

Called the Swivel-T, a new tire valve core features a precision-formed plug washer of super-slippery Teflon that self-swivels on a one-piece plug body. Use of Teflon enables easy non-stick installation and removal, positive air sealing, and long functioning life.

The self-swiveling action of the Teflon washer eliminates the need for a two-piece plug body and permits a

one-piece design with high mechanical strength. Once seated in the valve-stem, the Swivel-T stays locked in place until removed. *A. Schrader's Son, Div. of Scovill Mfg. Co.*

Circle 72 on postcard for more data

Air Line Filter

A new air line filter which drains automatically has been designed for use in air-operated tools and equipment. Using the pilot principle, the filter incorporates a float which admits air to a pilot valve chamber whenever liquid accumulates, opening a scavenger valve. Trapped liquid and impurities are then blown out the drain opening.

The "Auto Drain" filter is available in sizes from ¼ through 1 in. Transparent plastic bowls are supplied for pressures up to 150 psi; metal bowls for pressures to 250 psi. *Watts Regulator Co., Industrial Div.*

Circle 73 on postcard for more data

Small Electric Actuators

A new miniaturized line of electromechanical actuators is suitable for many applications requiring rotary and linear motion. Powered with either a-c or d-c, the motor meets requirements of MIL-M-7969 and MIL-M-8609.

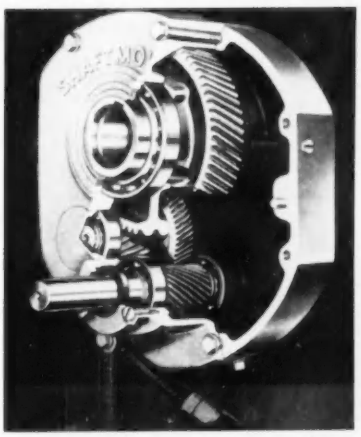
The units feature low backlash, accurate positioning, adjustable limit switches, non-reversible gear train and brake if required. *Nash Controls, Inc.*

Circle 74 on postcard for more data

Speed Changing Device

Designated the Shaftmount Synchro-gear, a new speed reducer for direct mounting on the driven shaft will be offered in a range of sizes covering ¼ to 40 hp, in speeds from 125 to 5 rpm. Two ratios are available—15 to 1 and 24 to 1.

Gear teeth are through-hardened to 45/50 Rockwell C. The case is made of cast iron for rigidity and ruggedness; the castings are normalized by heat-treating to prevent warp or stress. To assure shaft parallelism, the case is dowel-pinned together and both halves integrally bored, three holes in one operation. For conve-



nience, the tie rod is attached to the front and may be provided with an automatic overload device. *U. S. Electrical Motors Inc.*

Circle 75 on postcard for more data

Magnetic Limit Switch

Having no moving parts, a new magnetic limit switch is designed to act on proximity of its two sensing elements, rather than actual physical contact.

Known as the Amplet magnetic limit switch, the device is said to be suited

to those automation applications where precise control of the relative motion between two parts of a machine is required. Typical applications include limiting cuts or traverse on such machine tools as shapers, planers and drill presses; stopping conveyors at pre-determined positions; continuous sequencing and counting, and automatic weighing and filling.

The device consists of three parts—a probe, which is normally mounted on a stationary part of the machine being controlled; a magnetic trigger, which is mounted on a moving part of the machine or on the part being machined; and a power amplifier, which increases the power output of the probe to useful levels. *Consolidated Controls Corp.*

Circle 76 on postcard for more data

Special Shear Blades

In addition to special shear blades, a line of regular solid steel shear blades for the metal working industry are made in three grades—OK Battle Axe, for shearing up to and including ¼ in. mild steel or the equivalent; OK Dura-chrome, for shearing hot or cold plate up to ¼ in. or equivalent; and OK Utility, for any type shearing where only short runs or little shearing is done, and heavy plate shearing.

A special heat treating process gives these blades maximum toughness. All blades are held to ± 0.0015 for parallelism on width and thickness unless otherwise specified. *The Ohio Knife Co.*

Circle 77 on postcard for more data

Polishing Process

Luster Burr is a chemical polishing process that levels and brightens the surface of aluminum silicon castings. No electricity or heat is required. It brightens in 10 to 90 seconds at room temperature. This new finish is for use prior to anodizing, electro-plating, conversion coatings, wheel or barrel finishing, or for use as is. *Alchemize Corp.*

Circle 78 on postcard for more data

LP-Gas Vaporizer

For both OEM and field application, this Ensign Model "CV" LP-Gas vaporizer measures approximately 3-¼ in. diameter by 4-½ in. length.

While primarily designed to fit between the cylinder head and water outlet connection to the radiator, the vaporizer may be mounted in any position on or near the engine. *Ensign Carburetor Co.*

Circle 79 on postcard for more data

Rod End Couplers

Self-aligning rod end couplers for air and hydraulic cylinders are made to insure precision axial alignment between cylinder and machine and to simplify installation both on new equipment and equipment in the field.

The couplers meet the requirements of cylinders with either shouldered external threads or internal threads.

Couplers for ⅝, 1, 1-⅜, 1-¾, and 2 in. diameter rods are available from stock with larger sizes from 2-½ up to 5-½ in. made to order.

All surfaces of the self-aligning rod end couplers are black oxide finished after through hardening (jam nut not hardened) to 50-54 Rockwell C. *Hydro-Line Mfg. Co.*

Circle 80 on postcard for more data

Chromate Coating

Alodine 1200S, an addition to a line of amorphous chromate coatings for aluminum, is said to solve the problem of uniformity. It is particularly recommended for use in high production baths such as strip lines, by the manufacturer.

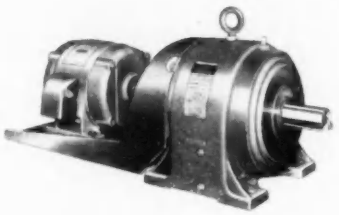
Alodine 1200S can be processed through continuous dip in the same time cycle other conversion coatings require for continuous spray. The dip technique has proved effective in reducing initial equipment costs and maintenance. *Amchem Products, Inc.*

Circle 81 on postcard for more data

Standard Gear Reducers

A line of standard gear reducers with mounting facilities to accommodate separate, coupling-connected Lima standard NEMA motors of suitable horsepower, speed and electrical characteristics has been designed.

They are available for horizontal foot mounted application, in either



double or triple reduction units; double reduction units have a horsepower range of 1 through 125, with reductions from 230 to 45 rpm. Triple reduction units range from 1 to 50 hp, with reductions from 37 to 7½ rpm.

Lima gear reducers are equipped with Duti-Rated lifetime gearing to give good wear life. In addition, they are all equipped with a spline drive pinion which permits quick ratio changes. The motor mounting is designed so stresses cannot affect shaft alignment. *The Lima Electric Co., Inc.*

Circle 82 on postcard for more data

Heavy Duty Oil Seal

Westinghouse Electric Corp. has announced a heavy duty oil seal for use with its Moduline gear units. This taconite seal is designed to prevent the entry of taconite or other abrasive dusts and particles into the gear housing.

A feature of the seal is a grease fitting which remains stationary even when the gear shaft is turning, enabling the grease in the seal to be replaced without stopping the machine.

Circle 83 on postcard for more data

A big feature for tomorrow's best selling cars!

TIRES OF BUTYL

Over the years versatile Enjay Butyl rubber has proven its superior performance in tubes, weatherstrips, radiator hose, shock absorbers and countless other automotive applications.

Imagine the outstanding selling opportunity of new cars equipped with Butyl tires. One short demonstration ride can prove all these unique features. Butyl tires *hug the road so well you can't make them squeal*, at any corner, at any speed, at any stop. So effective is their traction *they stop up to 30% quicker* than ordinary tires — even stop faster on wet surfaces than other tires do on dry. And because *Butyl absorbs shock energy better*, tires of Butyl *flow* over bumps, minimize shock, vibration, and noise.

Now the wide range of Butyl compounds gives new freedom to tire designers and product designers in every industry. Let us show you how Butyl can help you make better products.

For complete information—*Write or phone your nearest Enjay office. Enjay's extensive laboratories and expert staff are always glad to provide technical assistance on request.*

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Circle 136 on Inquiry Card for more data

Ford Plant Production of Vinyl Upholstery

(*Continued from page* 71)

under a pressure of 180 psi, permitting the fluid to handle a temperature of 300F or higher without boiling.

The calender produces vinyl film of specified thickness cut off into rolls of desired yardage. Control of the many variables in the calendering operations is very exacting since the thickness of the film, uniformity of thickness, and other properties depend upon it. To this end the machine is provided with an impressive Clark Control console, equipped with instrumentation for calibrating the various controls such as roll speeds, roll spacing, tension on the film, etc. These calibrations, in turn, are supplemented by the installation of an industrial Nucleonics Accuray attachment, housed in the console. It has a remotely located head with recording tape for calibrating to a median thickness with plus or minus limits. The Accuray control embodies a Beta-Ray attachment at the rolls for scanning the sheet, measuring thickness, and adjusting instantaneously for any variations. Readings are made in terms of oz/yd but these are almost directly comparable to thickness in thousandths of an inch.

Accuray adjustments are reflected in momentary changes in the spacing of the rolls. However, there is an additional control mechanism built into the machine for the purpose of deflecting the large bottom roll or both top and bottom rolls as required to maintain uniformity of film thickness, despite possible deflection of rolls due to high pressures and temperatures.

As the film issues from the calender, it is automatically rolled up and then cut off to suit the desired yardage. Film then is fed to the next operation where it is laminated onto the fabric. In this equipment the fabric is put through the rolls for thorough drying, then the film meets the fabric and is caused to adhere under heat and pressure. Near the end of the operation the coated fabric goes through the embossing roll which produces the desired grain pattern. The fabric is cooled before it leaves the machine, rolled up and delivered to the last operation.

The last formal operation is a fairly new development termed "top coating." It is a printing process which applies a highly volatile film over the vinyl to close up the pores of the coating, impart extra durability, highlight the color, and produce a material with a slippery surface for easy egress. This impervious film also makes the upholstery easily washable.

The fabric is rolled up once more and is transported to quality control stations where skilled inspectors scan each roll 100 per cent for visual defects as well as for color match with a master sample. The material is then held until physical and chemical tests have been completed to make sure it conforms to specifications.

The accepted rolls or bolts of material then are ready for transport to the trim cut-and-sew plants.

In addition to the mass production line described briefly above, the plant has a smaller, semi-automatic line for handling short runs or special types of materials. Besides vinyl upholstery fabric, Mt. Clemens also is producing extruded vinyl welt to match the fabric. Latest development in this phase of the operation is an extrusion technique which also embosses the outer edge with the same grain pattern as that of the fabric.

Finally, it is noteworthy that the plant has an extensive laboratory facility not only for routine testing but is also provided with small scale pilot equipment duplicating the machinery on the fabrication line. This facility makes it possible for the laboratory to produce small scale samples of any experimental fabrics that may be developed by styling. ■

MEN *in the* NEWS

(*Continued from page* 49)

Hoover Ball and Bearing Co.—**R. W. Ebey** was named general manager of the new Ball Div.

Cornell Aeronautical Laboratory—**A. Hertzberg** was named head of the Aerodynamic Research Dept.

Studebaker-Packard Corp.—**R. D. Faurot** was named director of styling.

Ford Motor Co., Aeronutronic Div. —**L. Brite** was appointed manager of space electronics, space technology operations.

Electric Auto-Lite Co. — **M. G. O'Neill** has been appointed manager of quality control and **G. L. Brock** chief industrial engineer of the electrical products group.

B. F. Goodrich Tire Co.—**E. C. Shingleton** was named manager of passenger tire sales and **John E. Jerome** succeeds him as product manager of agricultural and industrial tire sales in original equipment.

Spencer Chemical Co.—**K. A. Spencer** was elected chairman of the board and chief executive officer, and **J. C. Denton** president.

(*Turn to page* 116, *please*)

Jones & Laughlin Steel Corp., Stainless and Strip Div.—J. T. Bachman has been appointed a vice-president.

Chrysler Corp., Plymouth-De Soto-Valiant Div.—W. H. Wilson was appointed assistant general sales manager.

Chevrolet Motor Div., General Motors Corp.—E. P. Feely has become executive assistant general sales manager.

(Advertisement)

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Quick facts on cold heading

Compared to machining, cold heading gives stronger pieces at less cost. Also, the headers automatically control quality because unsound material cannot be used. While the scope of cold headers is wide indeed, it pays to design for them right at the start.

Some rules of thumb to guide you:

1. You save money after a run of 25,000 pieces (which pays for the set-up).
2. Maximum length of parts runs about 6 inches. Maximum volume of upset is equivalent to length of stock 4½ times its own diameter. (With special operations, up to 26 diameters have been achieved!)
3. Various metals and alloys are suitable. But keep carbon content in steel to under 0.45.
4. Concentric pieces are easier to form, though eccentric and serrated shapes are practical.
5. Avoid sharp corners. Allow generous radii.
6. Because upsets are usually cylindrical, oval or round shapes take less trimming than square or rectangular.
7. Hollow upsets tend to form cracks at edges of recess, so avoid them.
8. Embossing raises costs.
9. No problem heat treating short sections. But long sections are apt to be distorted.

When in doubt, contact an expert in cold heading.

How high strength fasteners affect the holes they fill

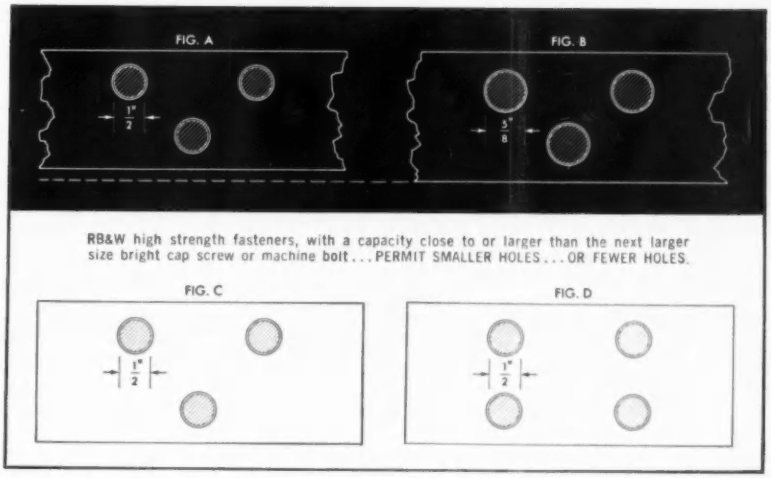


FIG. A
FIG. B
1/2
5/8
RB&W high strength fasteners, with a capacity close to or larger than the next larger size bright cap screw or machine bolt... PERMIT SMALLER HOLES... OR FEWER HOLES.
FIG. C
FIG. D
1/2
1/2

As simple a matter as the selection of fasteners can permit changes for better design . . . and also improve production costs and service life.

In sketch "A", for example, you see one difference from use of RB&W high strength fasteners instead of machine bolts or bright cap screws, as in "B". You use a smaller size fastener. Holes are therefore smaller. The metal section, in turn, can then be smaller for a saving in material and weight. The costlier the materials (copper bus bars as a case in point), the more significant the cost savings.

In sketch "C", fill the 3 holes with ½" high strength bolts, and you have a load capacity close to 40,000 pounds. That's the same as developed by 4 bright cap screws filling holes in Sketch D. It costs less to drill and less to fill the 3-hole design.

RB&W High Strength Fasteners are now identified by this new marking as well as 3 radial dashes. They have the proper balance between ductility and hardness required in high carbon units.

EFFECT ON PERFORMANCE AND PRODUCTION

When tightened to their full load, high strength fasteners not only *stay* tight—even under vibratory conditions—but also exert high clamping force. It has been shown that, under high compressive forces, hole areas gain extra resistance to fatigue cracks.

What's more, the high friction developed virtually locks members together, prevents slippage. Holes, therefore, need not be perfectly aligned since they can even be slightly oversized without detriment.

There's an RB&W Fastener Man ready to aid you in working with high strength bolts—in the design stage or as replacement for SAE grade 1 or 2 steel fasteners or for rivets. Write for helpful booklet DC-1, Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Circle 137 on Inquiry Card for more data

News of the MACHINERY INDUSTRIES

July Machine Tool Orders, Estimated at $63.45 Million Net, Declined from June Bookings to the Extent of $2 Million, But Continued General Upswing in Business

By Charles A. Weinert

July Machine Tool Sales Good, But Slightly Off

Net new orders for machine tools booked in July amounted to an estimated $63.45 million total, versus June's revised figure of $65.4 million—according to the latest statistics of the National Machine Tool Builders' Association.

The decline of roughly $2 million was attributed to the usual slump which occurs during the vacation period—plus minor effects from uncertainties caused by the steel strike. Overall, the volume under these conditions was considered to represent a continuance of the general upswing in business which has applied since last fall.

Of particular significance is the fact that $10.05 million of July's order bookings was obtained from foreign buyers. This business was equally divided, for all practical purposes, between the builders of cutting-type and of forming-type machines—about $5 million apiece. By the same token, domestic net new orders declined from $60.1 million in June to a preliminary July figure of $53.4 million.

On the other hand, domestic orders booked in July exceeded the domestic bookings in every prior month of 1959 with the exception of June—foreign orders in July almost doubling the average monthly volume during the first six months of 1959.

By comparison, July order volume estimated at $63.45 million net was 139 per cent more than July, 1958 bookings of $26.55 million.

July business was distributed $50.9 million for metal-cutting-type machine tools and $12.55 million in forming-type machine tools.

Shipments of both types of machines dropped from $50.05 million in June to $40.05 million in July—again reflecting the vacation period, also the lapse from upswinging order receipt and delivery. July, 1958's shipments, for comparison, amounted to $29.7 million. The estimated order backlog as of August 1st was 4.5 months, compared to 3.4 months at the end of January, 1959.

Distributors' Association Plans Annual Meeting

The American Machine Tool Distributors' Association has programmed several outstanding events for its Thirty-Fifth Annual Meeting. To be held at the Statler-Hilton Hotel in St. Louis, Mo., the time is Sunday through Tuesday, October 25-27.

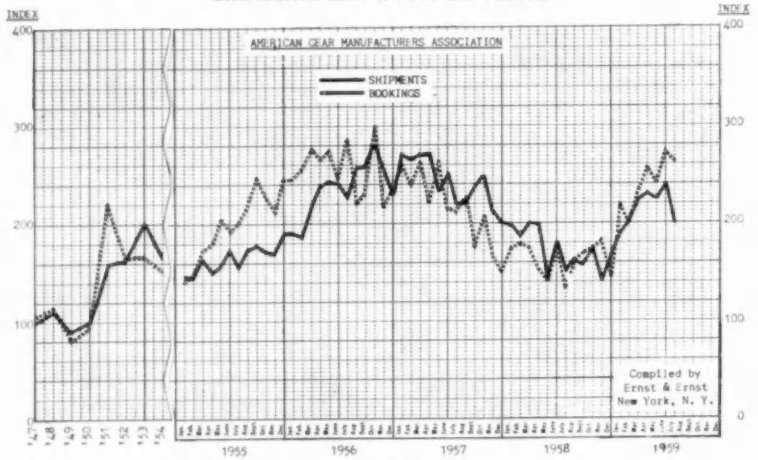
One of the highlights of the program will be an address by Charles W. Stewart, president of Machinery & Allied Products Institute, who will discuss international trade as related to the capital goods industries in this country. His talk will be based on extensive studies and evaluations of the subject made by MAPI.

A panel discussion on "Financing the Order" will be another of the features. T. Laurence Strimple, president of The National Acme Co., has been named moderator. Panel members are D. P. Booth, Booth Leasing Corp., San Francisco, Calif.; Robert J. McCullough, assistant cashier, First National Bank, Chicago, Ill.; and Frank Griesinger, controller, Lincoln Electric Co.

The program will be rounded out by executive committee reports, committee meetings, management forum sessions—and, of course, the usual social events which include a welcoming reception the first day of the conference, and a dinner dance scheduled for Monday evening, October 26. Local plant tours also are being planned.

(*Turn to page* 120, *please*)

GEAR INDUSTRY MONTHLY INDEX TRENDS
SHIPMENTS AND ORDER BOOKINGS



NOTE: Indices are based on Average Monthly Shipments 1947-1949 = 100.0. Average Monthly Figures are used for 1947-1954.

Here's where it pays to *Play it Safe!*

When you want reliability . . . dependability . . . specify Steel Springs. Come to Burton to get them!

Trucks, buses, trailers, off-highway equipment, and private motor cars of almost every prominent make use Burton Leaf or Coil springs as original equipment.

When you're "on" in one, and you'll have a birdie if you sink it, you just can't afford to take chances . . . it pays to play it safe!

In modern automotive design and engineering, it pays to play it safe where performance really counts . . . especially in the springs that cushion the shocks and carry the load. That's why the time-proven dependability of Burton springs is an indispensable advantage.

Passing every critical test, not only on the proving ground but *in actual service*, Burton springs have proven equal to the toughest tasks—enduring extreme conditions of high speed, rough roads and heavy loading.

Why not play safe and follow the example of America's leading trailer and truck builders. Let Burton engineers solve *your* spring problems.

BURTON

AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

WESTERN AVENUE AT FORTY-EIGHTH STREET
CHICAGO 32, ILLINOIS

AIR BRIEFS

By David A. Partridge

United DC-8's Start Coast-to-Coast Service

The first transcontinental coast-to-coast service using Douglas-built DC-8 Jet Mainliners is scheduled for September 18th, according to W. A. Patterson, president of United Air Lines.

Eastbound, the $5 million plane will cover the airways between New York and San Francisco in 5 hours—westbound, the flight will take 5¾ hours. United's plans call for expanding the new service by adding flights between New York and Los Angeles, Chicago and San Francisco, Chicago and Los Angeles, and San Francisco and Los Angeles sometime next month.

The DC-8 Mainliner, the newest addition to the all-jet transport fleet, accommodates 113 passengers. Its cargo capacity is 12,000 lb. It is powered by four Pratt & Whitney turbine engines, time tested and proved with over three million hours since 1953.

"Pinch Plasma" Engine Seen as Satellite Control

Designed for propelling interplanetary space ships, a "pinch plasma" engine was seen as having "a far more immediate purpose" in controlling present-day satellites.

Alfred Kunen, manager of the plasma propulsion project at Republic Aviation Corp., said that the low-thrust, low-fueled plasma engine could be used to power satellites after they have attained orbit.

In the present "state of the art," satellites fired into orbit by rockets have no in-built propelling power. By adding a low-powered engine to operate after attaining proper orbit, a satellite could prevent tumbling over itself, stay in orbit longer by overcoming the dragging force of particles in space, and change its own path of orbit to compensate for inaccuracies in the original firing.

The magnetic "pinch plasma" engine uses a hot gas for fuel and changes it into a plasma (a fourth state of matter evolving from gases in which the molecules are broken into electrons and positive ions). Secret of the engine is the method of compressing and accelerating a fluid in a cylindrical magnetic field and shooting plasma through a nozzle out the rear at tremendous velocities.

When used in interplanetary propulsion, the plasma engine will act as the power unit of a space ship after the ship has attained proper orbit around the earth. It would then be activated to propel the craft out of orbit and into an interplanetary flight path — operating intermittently to keep the ship on its assigned course.

SAE to Hold Aero Meeting in October

Los Angeles will host the SAE Aeronautic Meeting, October 5th through October 9th. Comprehensive studies of the engineering requirements of tomorrow's missiles, space vehicles, and aircraft—from the drafting board to operational status—will highlight the program.

Panel sessions, scheduled for October 5th and 6th, will deal largely with efficiency in design, construction, and manufacturing operations. Starting October 7th, and continuing through the 9th, sessions will feature the presentation of papers on equipment, structures, propellants, air terminal operation, experience with jet and supersonic transports, and related topics.

Hydrogen Peroxide Units in the X-15

Two small, 48-lb auxiliary power units, using hydrogen peroxide as fuel, provided the only energy for keeping the pilot alive during the first powered flight of the North American X-15 research plane.

The 40 hp units operated during the entire mission providing power to operate heating elements in the pilot's pressure suit and throughout the aircraft, the guidance system and its computers, radios, and recording equipment. Aircraft speed brakes, landing flaps and control surfaces also received power from the units.

How they work? By bringing hydrogen peroxide in contact with a catalyst, high energy steam is produced. The steam, in turn, spins a high-speed turbine which is geared to electric generators and hydraulic pumps, simultaneously producing both electric and hydraulic power. The units operate independent of the X-15's rocket engine.

During high performance missions later in the research program they will provide the sole source of power when the aircraft coasts to its highest altitude and on its glide back to earth, said W. C. O'Connel, general manager of General Electric's Accessory Turbine Department, developer of the equipment.

Liquid Gold Used in Missiles, Rockets

The application of liquid gold to sections of aircraft and missiles exposed to high temperatures has proved the metal to be usable as a reflector of infra-red radiation which is encountered in high-speed, high-altitude flight conditions.

(*Turn to Page* 114, *Please*)

Circle 139 on Inquiry Card for more data ——→

beauty is stainless steel

Look for the beauty of Stainless Steel on your new automobile. Its bright finish will make your car look better, stay in style longer and have a higher trade-in value.

No other metal offers the freedom of design and fabrication, economy of care and the durable beauty that serves and sells like Stainless Steel.

McLOUTH STEEL CORPORATION, Detroit 17, Michigan

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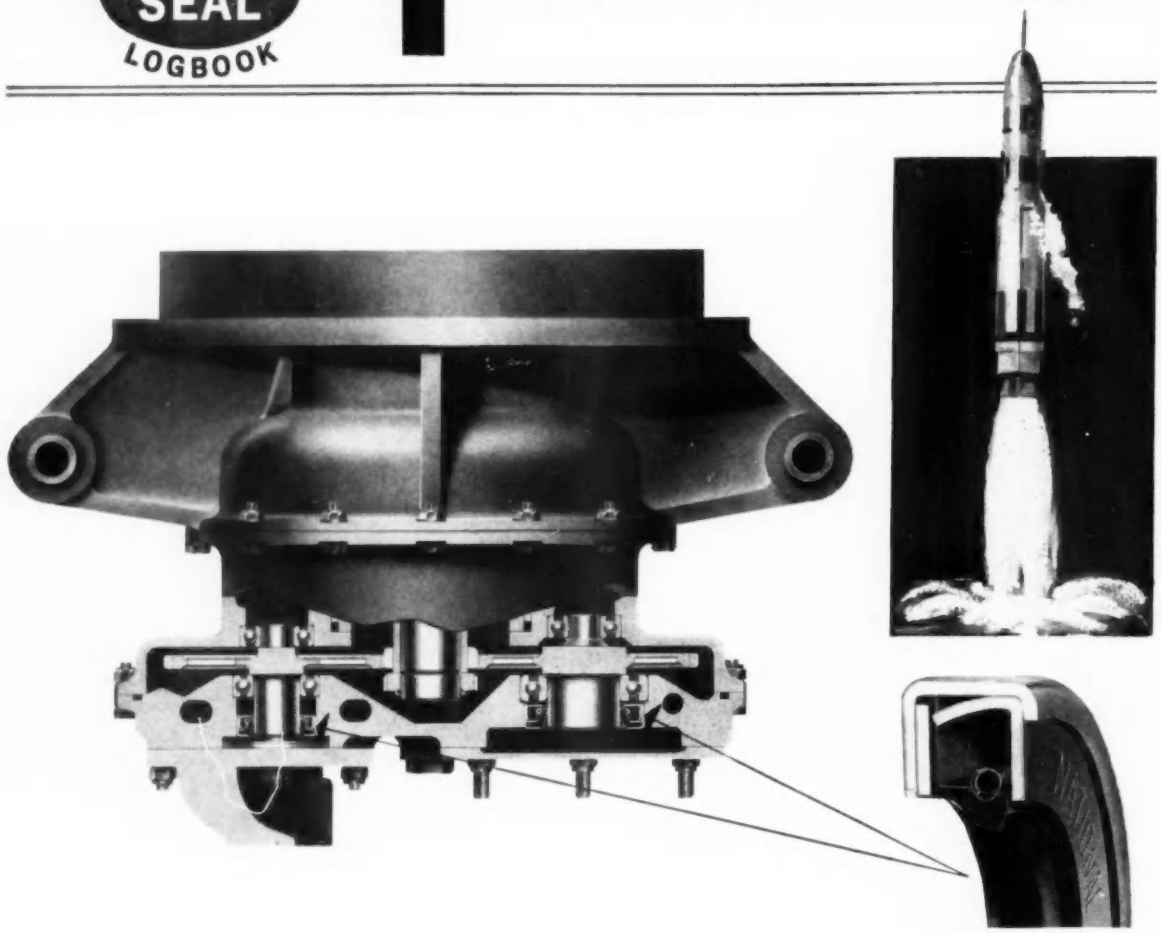
In Titan's first and second stages



Aerojet-General solves sealing problem on shafts accelerating 0 to 3,800 rpm in 1 second

Zero to 3,800 rpm in 1 second, on 1" band 1½" shafts. Synthetic-base lubricant to retain. Magnesium housing. Operating temperatures —65° F to 300° F. Utmost dependability an absolute essential. These are typical of operating conditions in the turbopump gear boxes of the first and second stages of the Titan missile.

Aerojet-General and National Seal engineers answered the shaft sealing problem on the 3,800 rpm shafts by adapting a standard-design National Oil Seal. The seal's outer case is aluminum for light weight and to match closely the coefficient of expansion of the magnesium housing. The tensioning spring is stainless steel, unaffected by synthetic lubricants. The single-lip sealing member is a specially compounded Buna N synthetic rubber, specifically designed for use with the synthetic-base lubricant.

National offers over 2,500 different standard design oil seals; provides special seals for special applications. For complete information or sealing engineering assistance, call your National Applications Engineer. He's listed under Oil Seals, in the Yellow Pages.

NATIONAL SEAL

Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Van Wert, Ohio; Downey and Redwood City, California.

5661

Circle 110 on Inquiry Card for more data

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

	Weeks Ending		Year to Date	
	Aug. 29	Aug. 22	1959	1958
PASSENGER CAR PRODUCTION				
Total—American Motors	.....	.....	267,758	113,912
Chrysler	.....	.....	50,265	35,553
De Soto	.....	.....	33,965	23,135
Dodge	11	2	108,959	68,702
Imperial	271	6	12,207	8,330
Plymouth	206	105	307,316	256,064
Total—Chrysler Corp.	488	113	512,712	391,784
Edsel	218	436	26,831	8,503
Ford	9,835	24,738	1,076,119	648,874
Lincoln	.....	241	18,749	17,192
Mercury	1,769	3,188	106,521	84,949
Total—Ford Motor Company	11,822	28,603	1,228,220	759,518
Buick	.....	.....	161,076	140,368
Cadillac	.....	.....	106,281	89,510
Chevrolet	2,932	2,405	1,122,298	885,554
Oldsmobile	30	.....	275,246	203,176
Pontiac	.....	.....	300,172	136,710
Total—General Motors Corp.	2,962	2,405	1,965,073	1,455,318
Total—Studebaker-Packard Corp.	3,059	725	101,880	23,701*
Checker Cab	.....	.....	2,839	2,120
Total—Passenger Cars	18,331	31,846	4,078,482	2,746,353
TRUCK AND BUS PRODUCTION				
Chevrolet	1,168	17	252,592	183,472
G. M. C.	485	440	61,511	40,686
Diamond T	101	91	4,094	3,534
Divco	80	80	2,452	1,824
Dodge and Fargo	1,441	1,547	53,643	38,588
Ford	4,951	6,172	233,466	148,485
F. W. D.	18	28	696	862
International	2,791	2,901	97,854	61,119
Mack	388	398	11,828	10,050
Studebaker	304	303	9,422	6,495
White	437	442	13,281	10,970
Willys	2,976	2,485	77,535	54,648
Other Trucks	65	65	2,523	2,073
Total—Trucks	15,205	14,969	820,897	562,806
Buses	5	5	1,625	2,310
Total—Motor Vehicles	33,541	46,820	4,901,004	3,311,469

* Includes Packard.

1959 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	June	Six Months 1959	Six Months 1958
Vans			
Insulated and refrigerated	245	2,165	1,628
Steel	51	300	202
Aluminum	194	1,865	1,426
Semi-insulated	133	464	268
Steel	133	464	268
Aluminum			
Furniture	166	856	908
Steel	147	697	908
Aluminum	19	159	
All other closed top	2,868	13,913	7,405
Steel	713	3,998	2,599
Aluminum	2,155	9,915	4,806
Open-top	288	1,383	820
Steel	134	581	435
Aluminum	154	802	385
Total—Vans	3,700	18,781	11,029
Tanks			
Non- and low pressure			
Petroleum			
Carbon and alloy steel	151	1,256	1,130
Stainless steel	32	152	109
Aluminum	179	858	631
Total—Petroleum	362	2,266	1,879
Chemical, food, fluid solids	44	241	372
All other, incl. aircraft refuelers	195	936	381
High Pressure (LPG, chemicals, etc.)	26	172	152
Total—Tanks	627	3,615	2,784
Pole, pipe and logging			
Single axle	33	176	157
Tandem axle	130	548	252
Total	163	724	409
Platforms			
Racks, livestock and stake	49	247	898
Grain bodies, all types	157	922	423
Platforms (flats), all types	1,067	5,315	2,627
Total—Platform	1,273	6,484	3,948
Low-bed heavy haulers	253	1,410	1,202
Dump trailers	251	1,353	1,290
All other trailers	220	1,562	821
Total—Complete Trailers	6,487	33,929	21,483
Trailer chassis[1]	289	2,308	1,599
Total—Trailers and Chassis	6,776	36,237	23,082

[1] Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS

Zone	Region	June 1959	May 1959	June 1958	Six Months 1959	Six Months 1958	Per Cent Change: June over May	June over June 1958	Six Months 1959 over 1958
1	New England	35,188	34,832	24,303	161,168	131,296	+ 1.02	+44.79	+22.75
2	Middle Atlantic	106,909	100,994	88,011	550,185	461,693	+ 5.86	+21.47	+19.17
3	South Atlantic	76,693	76,042	49,943	407,853	304,856	+ .86	+53.56	+33.79
4	East North Central	155,828	158,716	95,400	794,654	555,587	− 1.82	+63.34	+43.03
5	East South Central	24,322	24,658	17,428	138,342	104,243	− 1.36	+39.56	+32.71
6	West North Central	50,025	55,349	39,805	281,620	232,198	− 9.62	+25.68	+21.28
7	West South Central	48,833	45,929	34,820	258,653	216,360	+ 6.32	+40.24	+19.56
8	Mountain	20,291	20,087	14,412	110,260	86,216	+ 1.02	+40.79	+27.89
9	Pacific	66,727	65,659	46,895	378,146	277,740	+ 1.63	+42.29	+36.51
	Total—United States	584,816	582,266	411,017	3,080,881	2,370,189	+ .44	+42.29	+29.98

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., Ore., Wash.

1959 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	33,000 lb. and over	Total
First Quarter	155,408	51,094	3,915	25,857	35,133	15,806	10,358	9,801	307,372
Second Quarter	175,239	54,788	4,576	32,002	43,676	18,150	11,513	11,505	351,449
Total—Six Months	330,647	105,882	8,491	57,859	78,809	33,956	21,871	21,306	658,821
July	58,411	15,893	1,757	10,943	14,011	6,801	3,520	3,351	114,687
Total—Seven Months—1959	389,058	121,775	10,248	68,802	92,820	40,757	25,391	24,657	773,508
Total—Seven Months—1958	248,493	75,057	8,316	53,248	58,095	31,319	17,741	17,079	509,348

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period July 1 to Aug. 31, inclusive.

AEROJET GENERAL CORP., Sacramento, Calif.
Rocket engines, 162 ea—$100,332

AIRCRAFT TOOLS INC., Los Angeles, Calif.
Swaging machine—$86,700

ALABAMA BRIDGE & IRON CO., Talladega, Ala.
Trailer, lift, aircraft, 106 ea—$328,630

AMERICAN MOTORS CORP., Detroit, Mich.
Passenger cars, 338 ea—$531,575

AUTOMATIC TRANSPORTATION CO., DIV. OF YALE & TOWNE MFG. CO., Chicago, Ill.
Truck, forklift, 5 ea—$32,145

AVCO CORP., CROSLEY DIV., Cincinnati, Ohio
Spare parts, aircraft—$27,121

BAKER INDUSTRIAL TRUCKS, DIV., OTIS ELEVATOR CO., Cleveland, Ohio
Truck, lift fork, 40 ea—$260,126

BELL HELICOPTER CORP., Fort Worth, Tex.
Helicopter and related support equipment—$51,240

BENDIX AVIATION CORP., PRODUCTS DIV., South Bend, Ind.
Spare parts, aircraft—$239,505

BENDIX AVIATION CORP., SCINTILLA DIV., Sidney, N. Y.
Spare parts, aircraft engines—$203,312

BRYANT CHUCKING GRINDER CO., Springfield, Vt.
Internal grinding machine, 1 ea—$28,110

CESSNA AIRCRAFT CO., Wichita, Kans.
T-37B trainer airplanes—$1,000,000

CHRYSLER MOTORS CORP., Washington, D. C.
Passenger cars, 242 ea—$418,581

CHRYSLER MOTORS CORP., Washington, D. C.
Sedans and station wagons, 87 ea—$145,928

CHRYSLER MOTORS CORP., Washington, D. C.
Trucks, 47 ea—$83,434

CHRYSLER MOTORS CORP., Detroit, Mich.
Automobile, sedan, 23 ea—$32,821

CHRYSLER MOTORS CORP., Detroit, Mich.
Truck, chassis, 78 ea—$118,159

CHRYSLER CORP., SERVICE PARTS & ACCESSORIES SUPPLY DIV., Detroit, Mich.
Cab door, right and left assy, 1,782 ea—$67,764

CINCINNATI MILLING & GRINDING MACHINES, INC., Cincinnati, Ohio
Grinder, cylindrical—$96,532

CINCINNATI MILLING & GRINDING MACHINES, INC., Cincinnati, Ohio
Milling machine, 13 ea—$1,935,715

CLARK EQUIPMENT CO., Benton Harbor, Mich.
Loaders, wheeled—$481,750

CLEVELAND AUTOMATIC MACHINE CO., Cincinnati, Ohio
Automatic screw machine, 9 ea—$105,830

CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Spare parts, aircraft—$241,315

COLONIAL BROACH & MACHINE CO., Warren, Mich.
Machine, broaching, vertical, 4 ea—$93,980

CONTINENTAL MOTORS CORP., Detroit, Mich.
Engine, gasoline, 1,592 ea—$365,353

COOPER TIRE & RUBBER CO., Findlay, Ohio
Tire, 55,000 ea—$1,058,200

DAYTON RUBBER CO., Dayton, Ohio
Tire, 3,000 ea—$33,870

DELAWARE VALLEY MACHINERY, INC., Willow Grove, Pa.
Jig boring machine, 3 ea—$94,397

DEMPSTER BROTHERS, INC., Knoxville, Tenn.
Truck, materials handling-container, 189 ea—$102,750

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.
Spare parts, aircraft—$29,051

(*Turn to page 96, please*)

CONTROL OF QUALITY

BEGINS MILES AWAY FROM MARSHALL

Even the scrap we buy comes only from sources where the analysis is known, segregation is carefully maintained and uniformity is absolute. It must be clean, dry, and uncontaminated — and kept so until charged into the furnace.

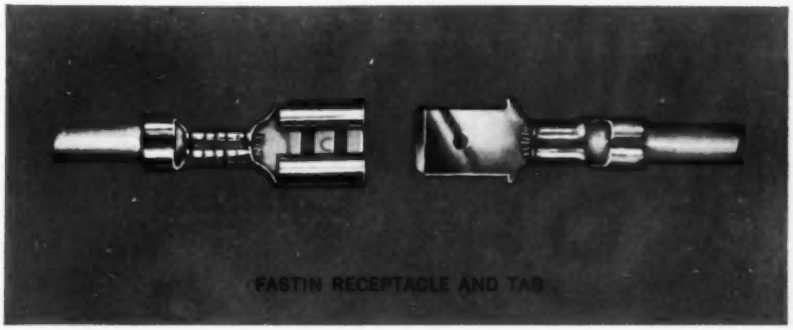
Customer needs require us to be equally uncompromising with *all* raw materials! Since analysis must meet specifications not "almost" but exactly, every shipment received is meticulously checked and analyzed.

Few foundries match our ability to produce such tightly controlled, constantly policed casting quality in high volume. This has been our specialty through 13 busy years.

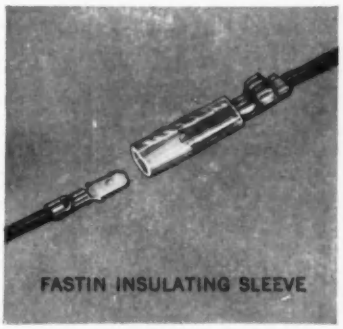
"THE PRESCRIPTION COUNTER FOUNDRY"

EI ENGINEERING CASTINGS, INC.
MARSHALL, MICHIGAN

Licensed Producers of Ni-Hard, Ni-Resist, Ductile Iron, and Ductile Ni-Resist



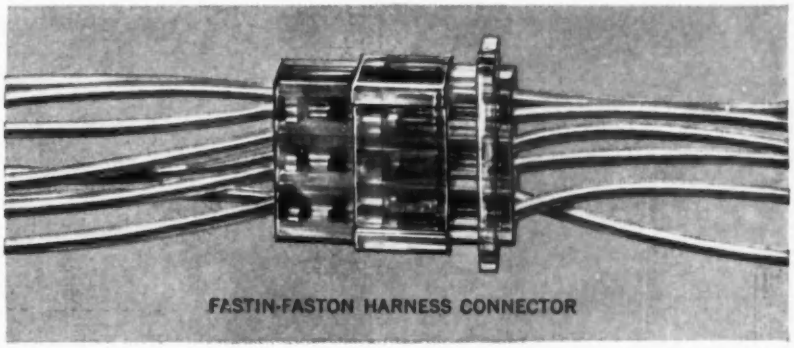
FASTIN RECEPTACLE AND TAB



FASTIN INSULATING SLEEVE

ECONOMY TAILORED TO YOUR CIRCUITRY REQUIREMENTS

FASTIN-FASTON
SINGLE IN-LINE SPLICE



FASTIN-FASTON HARNESS CONNECTOR

THE A-MP FASTON® LINE

It terminates the best circuits in the appliance and automotive fields.
It's an A-MP Automachine product featuring remarkable
production rates. It offers the highest reliability and . . .
the total installed cost is lower than anything you're now using.

That's the A-MP Faston® line.

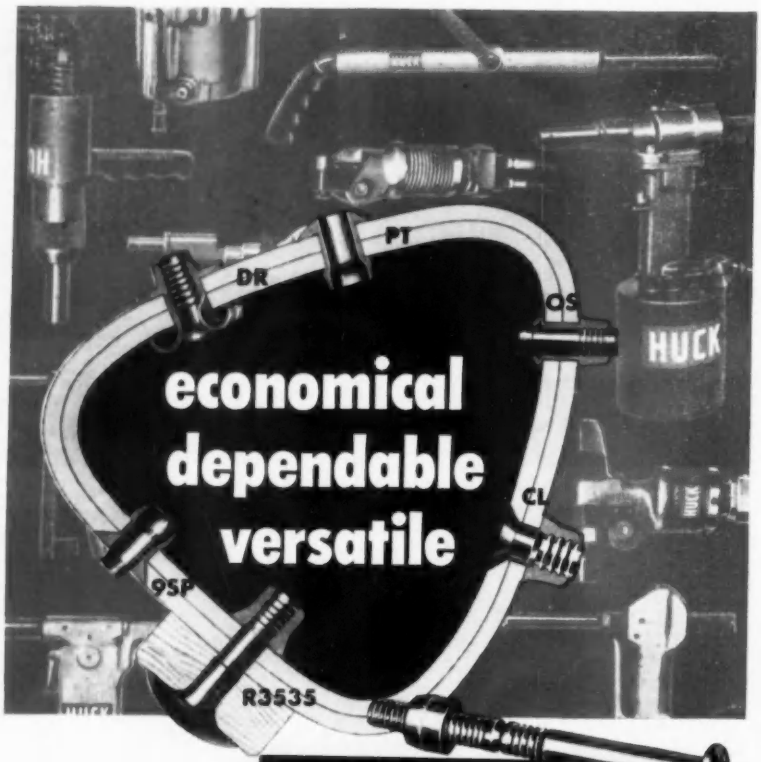
Equally important, the A-MP Faston receptacle has outstanding
vibration resistance, a broad temperature tolerance range and
uniform performance in quantities of one or a million.
Made in single circuit units (flag or straight receptacles) and
Fastin-Faston connector units (one or six circuits), this A-MP
line offers unbeatable versatility to fit practically any
circuit connection requirement in tab width .250, .205, .187, and .110.

If you are not specifying "A-MP" to save on your circuitry design and production costs, send today for the new A-MP Faston Catalog.

AMP INCORPORATED

GENERAL OFFICES: HARRISBURG, PENNSYLVANIA

A-MP products and engineering assistance are available through subsidiary companies in: Canada • England • France • Holland • Japan



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CL
High strength, shear and tension.

9SP
Low cost blind fastener.

PT
Grommet type blind fastener.

DR
Broad grip, broad bearing.

OS
High strength blind fastener.

R3535
High strength, broad bearing.

Nearly two thirds of any fastening operation cost is in labor.

The Huck fastening system is designed for time saving, uniform installation with greater fastener dependability.

Huck pneumatic, hydraulic or manual installation tools are compact, light and easy to operate. Even with unskilled operators, installation rates of 25 to 30 fasteners per minute are normal.

There is a Huck fastener for every need—high shear or tension, self sealing, broad bearing, hole broaching, hollow or pin retaining, blind or regular style — aluminum, steel or high temperature metals—headstyles, diameters and lengths to fit your job.

Write for Huck's Fastener Catalog. Our experienced fastener engineers will gladly help you.

HUCK MANUFACTURING COMPANY

2480 Bellevue Avenue • Detroit 7, Michigan • Phone WA 3-4500

(Continued from page 94

DOUGLAS AIRCRAFT CO., INC., Charlotte, N. C.
NIKE spare parts & components—$234,952

EASTMAN KODAK CO., Rochester, N. Y.
Spare parts, aircraft—$27,645

EIDAL MFG. CO., INC., Albuquerque, New Mex.
Trailer, chassis—$961,680

EKSTROM CARLSON & CO., Rockford, Ill.
Milling machines, 2 ea—$197,017

EX-CELL-O CORP., Detroit, Mich.
Internal thread grinder, 1 ea—$45,195

FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.
Guided missile—$75,600

FORD MOTOR CO., FORD DIV., Washington, D. C.
Passenger cars, 845 ea—$1,334,717

FORD MOTOR CO., FORD DIV., Washington, D. C.
Trucks, 170 ea—$380,491

FORD MOTOR CO., GOVERNMENT SALES DEPT., Washington, D. C.
Trucks, 12 ea—$59,218

FOSDICK MACHINE TOOL CO., Cincinnati, Ohio
Machine, jig boring, 1 ea—$78,180

FT. WAYNE TRUCK PARTS & EQUIPMENT, INC., Fort Wayne, Ind.
Wheel, steering, 12,057 ea—$55,100

GENERAL ELECTRIC CO., SMALL AIRCRAFT ENGINE DEPT., West Lynn, Mass.
Engines, 105 ea—$5,392,025

GENERAL MOTORS CORP., ALLISON DIV., Indianapolis, Ind.
Turbo-prop engines, 55 ea—$4,950,000

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Michigan
Passenger cars, 7 ea—$16,416

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Trucks, 34 ea—$118,426

GENERAL MOTORS CORP., CLEVELAND DIESEL ENGINE DIV., Cleveland, Ohio
Repair parts for Diesel engines, 25 ea—$31,878

GENERAL MOTORS CORP., FOREIGN DIST. DIV., New York, N. Y.
Sedan, 4 ea—$6,258

GENERAL MOTORS CORP., TRUCK & COACH DIV., Pontiac, Mich.
Parts, truck, 2,569 ea—$39,331

GENERAL MOTORS CORP., TRUCK & COACH DIV., Pontiac, Mich.
Transmission assy—$1,388,250

GENERAL STEEL TANK CO., INC., North, Birmingham, Ala.
Semitrailer, tank, 8 ea—$64,460

GERSTENSLAGER CO., Wooster, Ohio
Truck, bookmobile, 5 ea—$53,420

GIBRALTAR MANUFACTURING CO., Detroit, Mich.
Sprocket, final drive track, 9,989 ea—$237,338

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheels, for nose landing gear assys, 396 ea—$26,548

B. F. GOODRICH CO., Dayton, Ohio
Wheel, landing gear, 35 ea—$28,175

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Brake assys, aircraft—$193,830

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Spare parts, aircraft—$29,718

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Tire, 27,285 ea—$1,030,554

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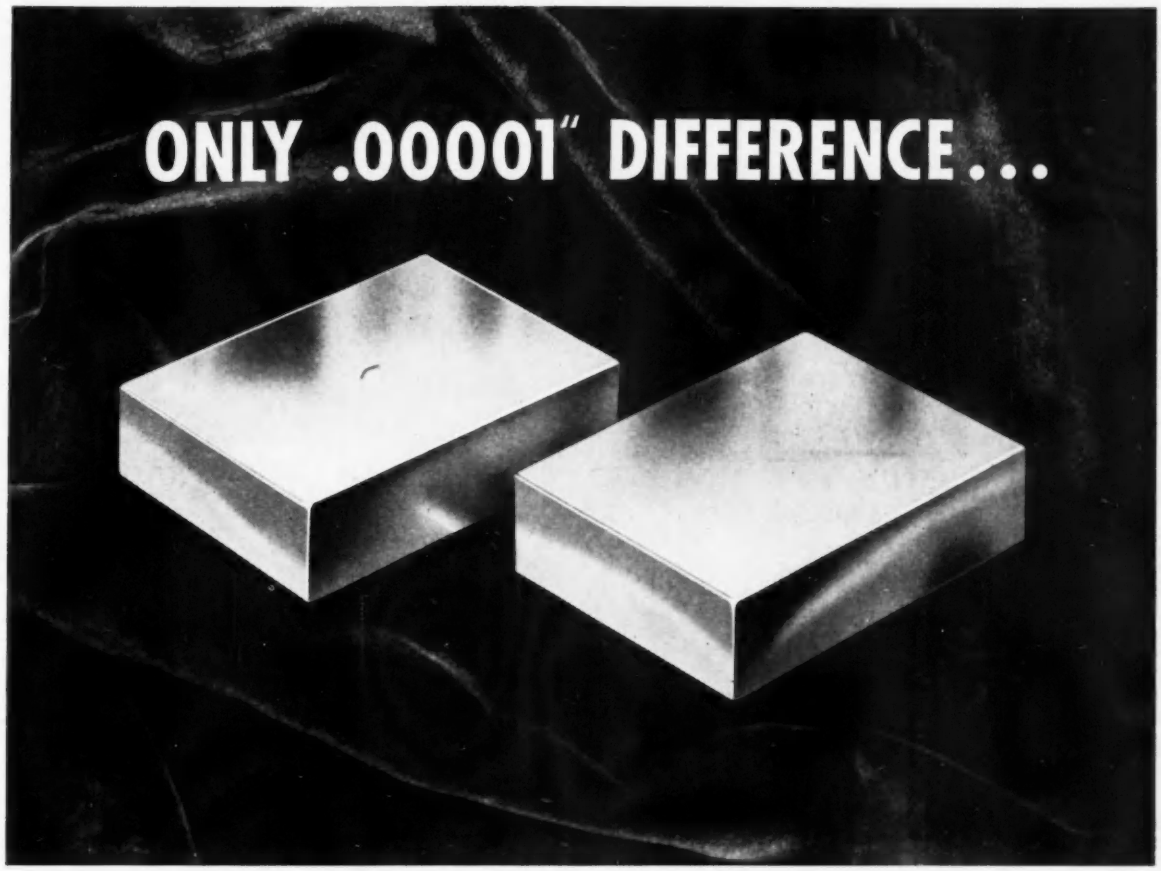


but one is a gage block...the other is junk!

In maintaining the high standards of precision required in your products, you certainly wouldn't waste good money on measuring equipment that merely "comes close." Either it's right or it isn't. The same is true in balancing.

What about your balancing tolerances?

Today's tolerances are far more critical than those of just a few years ago—and tomorrow's higher speeds will require even greater accuracy in rotating parts. To depend on "close enough" is risky.

What are your needs?

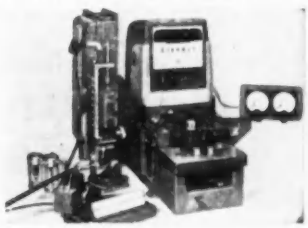
Your choice of balancing equipment could have an important effect on your future competitive standing. Your product quality and unit cost will be affected by all of these balancing factors that should be considered before you buy ANY machine: capacity required based on present and future needs; accuracy of plane separation and angular location of unbalance; simple calibration to permit amount indication in terms of correction methods you actually use; and integral correction equipment. Quick setup and fast, simple operation by unskilled operators can mean substantial savings, too!

Test *before* you buy!

To help you determine your needs and to simplify the job of comparing competitive machines, Gisholt offers you a new booklet, "Performance Tests for Balancing Machines." This details a series of tests on which no reliable supplier will refuse to cooperate. Ask your Gisholt Representative for your free copy—or write us.

HS-1 Balancer cuts costs, ups accuracy on 2¼ oz. aircraft control motor armature assemblies.

Part operates at 13,600 r.p.m. Bearing movements must not exceed 0.000050". Unbalance corrected in special drill press fixture (at left in photo). Production, more than 15 parts per hour, including correction by drilling at the 0.245" O.D. radius in two transverse planes only ½" apart, and inspection.



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Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • *Factory-Rebuilt Machines with New-Machine Guarantee*

(Continued from page 96)

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assys, aircraft, 1,342 ea—$354,159

HAMILTON TRAILER CO., INC., Hamilton, Tex.
Chassis, semitrailer, 232 ea—$650,449

HEALD MACHINE CO., Worcester, Mass.
Internal grinding machine, 4 ea
Rotary surface grinder, 1 ea
Grinding machine, 5 ea—$202,170

HOLLEY CARBURETOR, Warren, Mich.
Spare parts, aircraft—$2,602,746

HOOVER ELECTRIC CO., Los Angeles, Calif.
Spare parts, aircraft—$66,790

HOUDAILLE INDUSTRIES, INC., BUFFALO HYDRAULICS DIV., Buffalo, N. Y.
Spare parts, aircraft—$195,632

FRANK G. HOUGH CO., Libertyville, Ill.
Loader, front end, 6 ea—$487,245

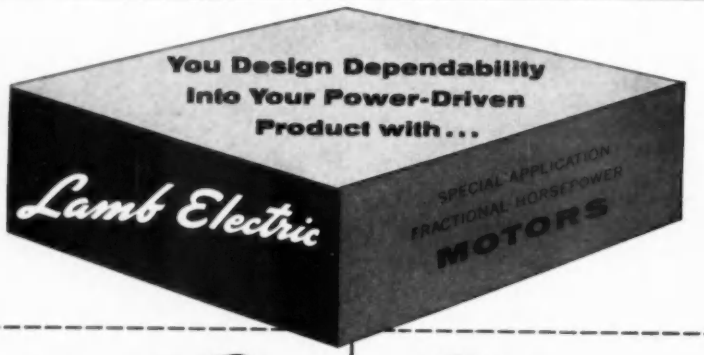
FRANK G. HOUGH CO., Libertyville, Ill.
Two aircraft tow tractors—$131,221

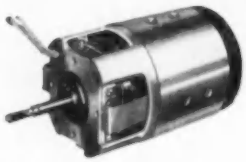
HUCK MFG. CO., Detroit, Mich.
Riveter, blind, pneumatic, 64 ea—$30,256

INDUSTRIAL BROWNHOIST CORP., Bay City, Mich.
Crane, 1 ea—$109,315

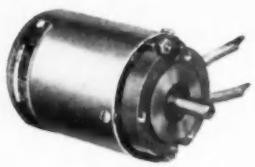
INSLEY MFG. CORP., Indianapolis, Ind.
Crane, 4 ea—$262,608

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks, 273 ea—$758,708

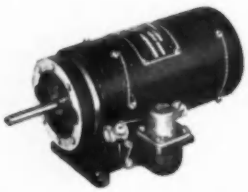




24 Volt DC motor for operation submerged in jet fuel for booster pump drive. Frame 4 x 1½



Six-pole 400 cycle AC motor for electronic cooling in missile control equipment. Frame 1⅞ x 1¼



Totally enclosed fan-cooled 27 volt DC motor for pump drive. Frame 2 x 1½

24 Volt DC fuel valve actuator incorporates gear train torque-limiting clutch and limit switches. Frame 1⅜ x ⅝

Thorough study by our engineering department of your product and its operating conditions is the first step in designing a Lamb Electric motor that will assure required dependability.

The next step is translating this information into a motor design having the electrical and mechanical characteristics needed for your particular application.

We then custom manufacture the motor on a volume basis to obtain high quality, uniformity and the most favorable cost.

May we discuss these advantages of Lamb Electric motors with you?

THE LAMB ELECTRIC COMPANY · Kent, Ohio
A Divison of American Machine and Metals, Inc.
In Canada: Lamb Electric — Division of Sangamo Co. Ltd. — Leaside, Ontario

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Ill.
Trucks, 27 ea—$86,862

INTERNATIONAL HARVESTER CO., Melrose Park, Ill.
Tractor, full tracked, 22 ea—$213,000

JONAS AIRCRAFT & ARMS CO., INC., New York, N. Y.
Piper Airplanes, 7 ea—$50,461

KEARNEY & TRECKER CORP., Milwaukee, Wis.
Milling machine, 5 ea—$278,984

KENTUCKY MFG. CO., Louisville, Ky.
Semitrailer, van, 4 ea—$54,107

LAPOINTE MACHINE TOOL CO., Hudson, Mass.
Machine, broaching, vertical, 3 ea—$61,200

LEAR, INC., ROMEC DIV., Elyria, Ohio
Spare parts, aircraft—$47,083

H. W. LOUD MACHINE WORKS, INC., Pomona, Calif.
Spare parts, aircraft—$146,266

H. W. LOUD MACHINE WORKS, INC., Pomona, Calif.
Spares for aircraft hydraulic, de-icing system—$67,569

LUNDY MFG. CORP., Glen Head, L. I., N. Y.
Spare parts, aircraft—$645,987

MACHINERY ASSOCIATES, INC., Wynnewood, Pa.
Milling machine, 1 ea—$174,499

MACHINERY ASSOCIATES, INC., Wynnewood, Pa.
Toolmaker's and engine lathes, 6 ea—$89,211

McDONNELL AIRCRAFT CORP., St. Louis, Mo.
Spare parts, aircraft—$783,916

MENASCO MFG. CO., Burbank, Calif.
Shock strut, main landing gear, 104 ea—$310,913

MENASCO MFG. CO., Burbank, Calif.
Spare parts, aircraft—$84,461

MOHAWK RUBBER CO., Akron, Ohio
Tire, 21,799 ea—$550,823

NEW BRITAIN - GRIDLEY MACHINE CO., New Britain, Conn.
Lathe, engine—$68,880

VAN NORMAN MACHINE CO., DIV. OF VAN NORMAN INDUSTRIES, INC., Springfield, Mass.
Milling machine, 5 ea—$118,505

NORRIS-THERMADOR CORP., Los Angeles, Calif.
Rocket, motor assy, 3,775 ea—$397,566

NORTHROP CORP., NORAIR DIV., Hawthorne, Calif.
Spare parts, aircraft—$129,116

NORTH AMERICAN AVIATION, INC., Canoga Park, Calif.
Rocket engines—$287,583

PRATT & WHITNEY CO., INC., West Hartford, Conn.
Jig, boring machine, 2 ea—$87,198

PRATT & WHITNEY CO., INC., West Hartford, Conn.
Milling machine, 2 ea—$83,660

REPUBLIC AVIATION CORP., Farmingdale, L. I., N. Y.
Aircraft and support items—$4,500,000

REVERE CORPORATION OF AMERICA, Wallingford, Conn.
Spare parts, aircraft—$61,870

ROCKWELL STANDARD CORP., TRANSMISSION & AXLE DIV., Detroit, Mich.
Transfer case 2½ ton truck, 2,067 ea—$763,151

(Turn to page 102, please)

it will still be as beautiful when she grows up

UNILOY
STAINLESS STEELS

Yes . . . when she's ready to drive her own car, she too will want the long lasting beauty and protective qualities of solid stainless steel trim . . . and if this car is still around, the trim will be just as beautiful as it is today.

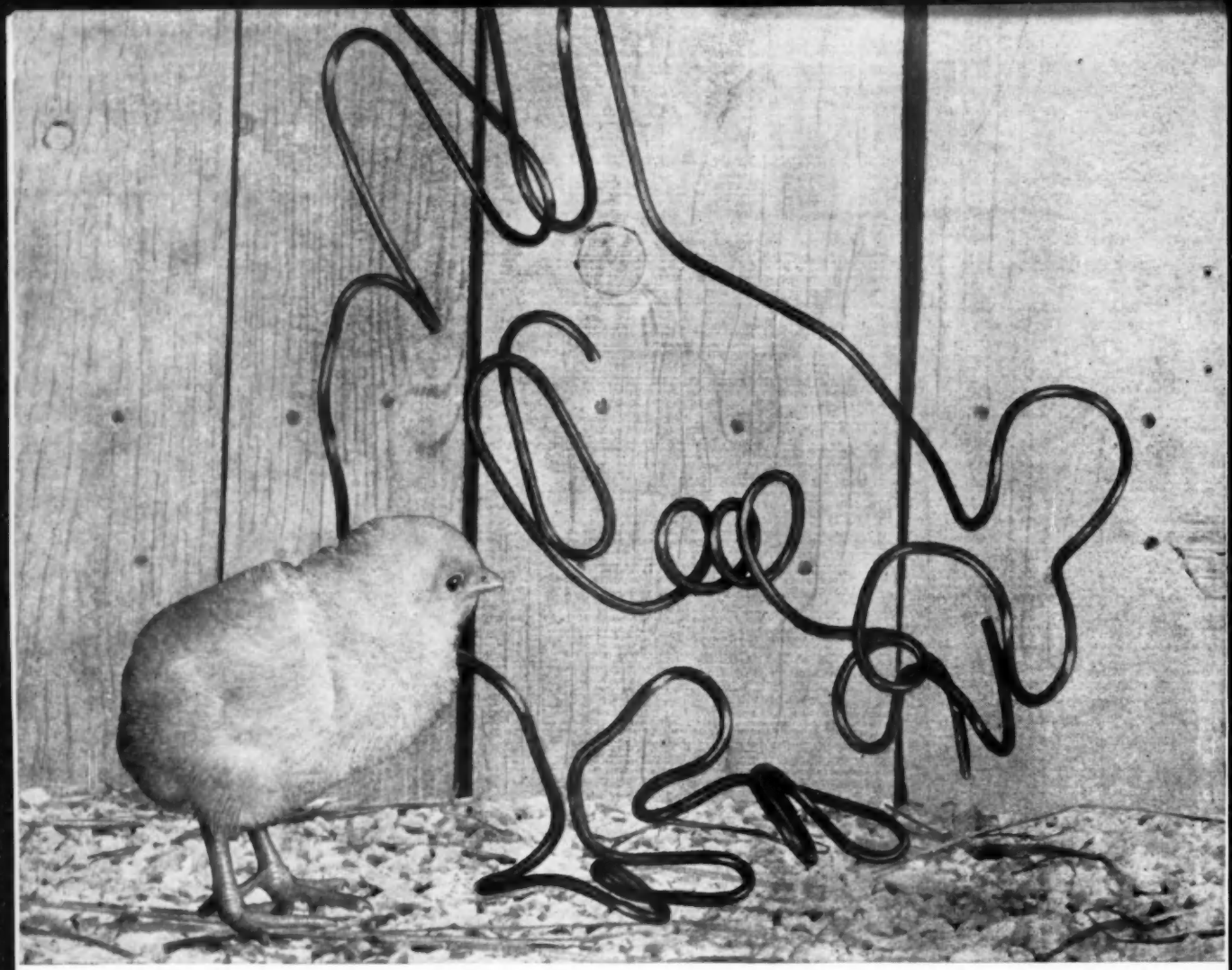
For stainless that offers maximum ease of fabrication and lasting, lustrous finish, specify Uniloy Stainless Steel.

UNIVERSAL CYCLOPS
UC STEEL
STEEL CORPORATION
BRIDGEVILLE, PA.

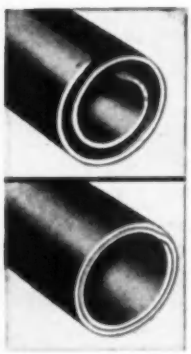
STAINLESS STEELS • TOOL STEELS • HIGH TEMPERATURE METALS

Circle 147 on Inquiry Card for more data

Circle 148 on Inquiry Card for more data



There's almost no limit to the things Bundy can mass-fabricate



Bundyweld is the original tubing double-walled from a single copper-plated *steel* strip, metallurgically bonded through 360° of wall contact for amazing strength, versatility.

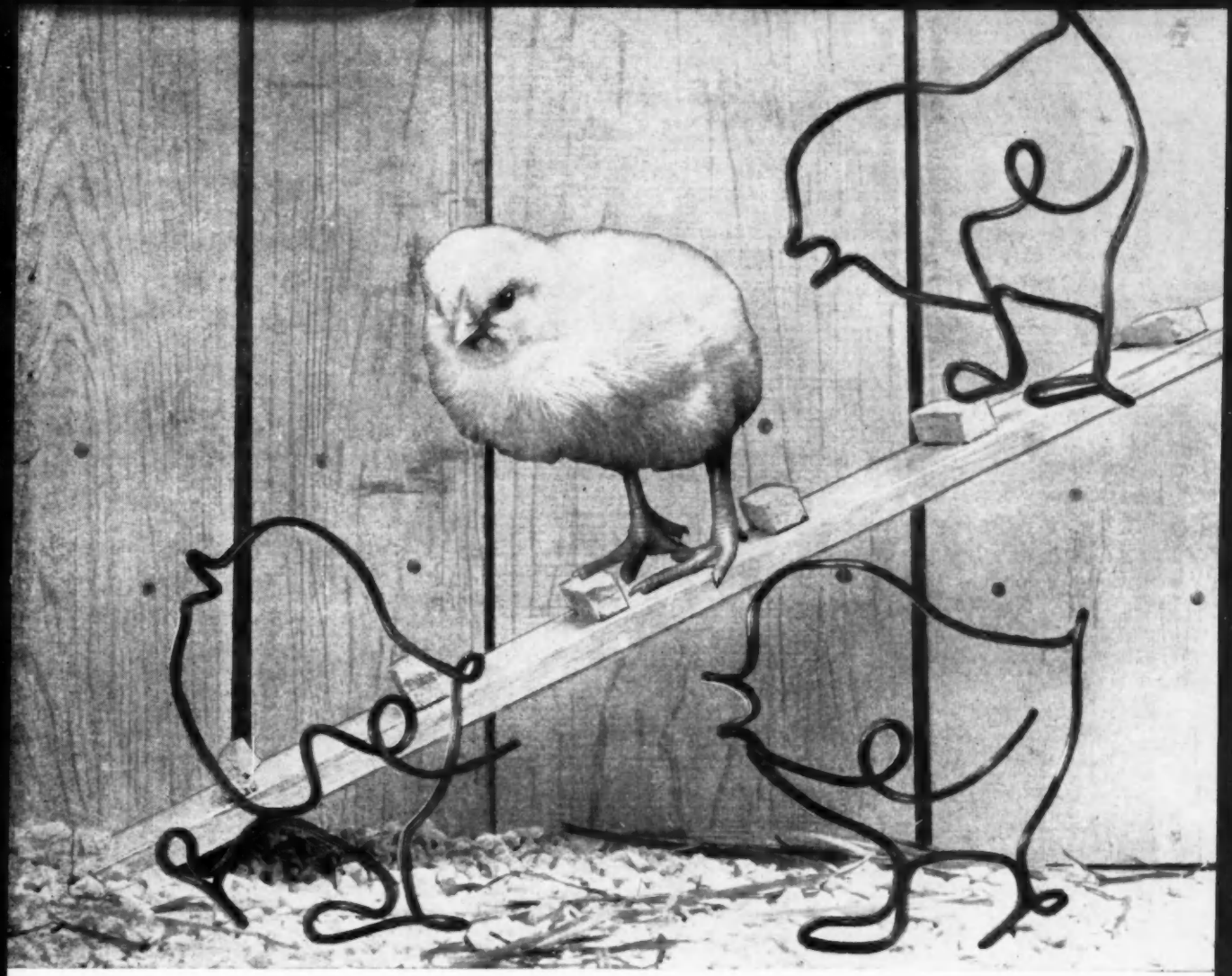
Bundyweld is lightweight, uniformly smooth, easily fabricated. It's remarkably resistant to vibration fatigue; has unusually high burst strength. Sizes up to ⅝" O.D.

The old adage, "Don't count your chickens before they hatch," is a good one . . . but it rarely applies to Bundy. That's because, no matter how complex your tubing problem, you *can* count on Bundy for the perfect solution.

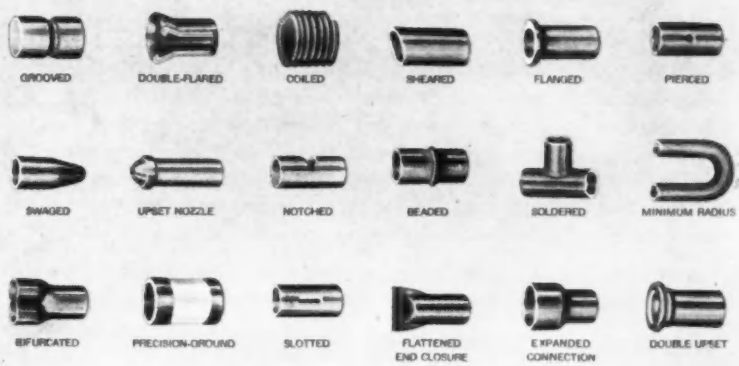
Bundy engineers and designers are backed by years of experience in the mass-fabrication of steel tubing. And they are available to you at any stage of product development for time- and money-saving suggestions. Their key: Bundyweld®!

Bundyweld steel tubing is double-walled, copper-brazed, leak-proof by test. Used on many applications in 95% of today's cars, Bundyweld is the tubing standard of the automotive industry.

So, when you want to talk tubing, talk to the leader—Bundy! Phone, write, or wire Bundy Tubing Company, Detroit 14, Michigan.



No matter what type of mass-fabrication you require, Bundyweld may be your answer. Shown here are just a few tubing operations designed and fabricated by Bundy—many for use in the automotive industry.



There's no substitute for the original

BUNDYWELD TUBING

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, BRAZIL, ENGLAND, FRANCE, GERMANY, AND ITALY

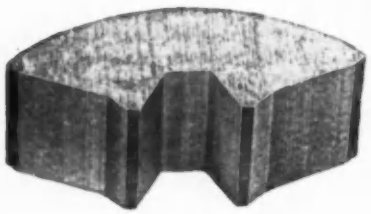
BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.

WORLD BESTOS BRAKE LINING

... any *shape* ... any *size* ... any *friction* to meet your most exacting requirements!

ROUND

as for Race Cars

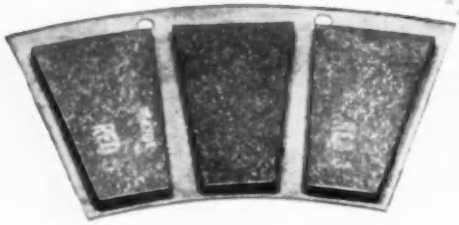


INTRICATE

as for Industrial Brakes

TINY

as for small Precision Assemblies



BIG

as for giant Forming Presses

● World Bestos is currently helping many manufacturers solve difficult braking problems with special friction formulas that assure dependable stopping power, non-fading performance and extra long life.

World Bestos offers extensive research and development facilities and more than 30 years' specialization in friction material manufacture. Modern, high-capacity plant assures on-schedule delivery.

● **Write for new Industrial Brake Folder . . . or let us know your specific requirements. Send prints and specifications if possible. Engineering assistance available.**

WORLD BESTOS NEW CASTLE INDIANA

DIVISION OF THE Firestone TIRE & RUBBER CO.

Industrial and Automotive Brake Blocks and Linings · Transmission Linings · Special Clutch Facings · Vibration Controls · Sheet Packing

(*Continued from page 98*)

SAFWAY STEEL PRODS. INC., Milwaukee, Wis.
Crane, floor, mobile, 20 ea—$59,745

H. C. SCHILDMEIER CO., Indianapolis, Ind.
Truck, lift, wheel, 262 ea—$25,518

SHEFFIELD CORP., Dayton, Ohio
Grinding machine, 1 ea—$29,030

SONOTONE CORP., Elmsford, N. Y.
Battery, aircraft, 1,653 ea—$1,280,248

SPERRY RAND CORP., Great Neck, L. I., N. Y.
Spare parts, aircraft engine—$121,913

SPERRY RAND CORP., ENGINEERING LABORATORY DIV., Salt Lake City, Utah
Sergeant missile—$14,320,690

STROMBERG-CARLSON CO., DIV. OF GENERAL DYNAMICS CORP., Rochester, N. Y.
Machine, turret drilling—$33,020

SUNDSTRAND MACHINE TOOL, DIV. OF SUNDSTRAND CORP., Belvidere, Ill.
Automatic lathe, 5 ea—$104,808

TALCO ENGINEERING CO., Mesa, Ariz.
Parts, aircraft—$243,807

THIOKOL CHEMICAL CORP., UTAH DIV., Brigham City, Utah
Rocket engines, 88 ea—$796,664

TOOL & ABRASIVE ENG. CO., San Jose, Calif.
Grinder, 1 ea—$41,624

TRANSCO PRODUCTS INC., Los Angeles, Calif.
Spare parts, aircraft, 15 to 920 ea—$135,249

UNITED AIRCRAFT CORPORATION, PRATT & WHITNEY AIRCRAFT DIV., East Hartford, Conn.
Engines, 205 ea—$25,467,284

UNITED STATES RUBBER CO., FISK TIRES DIV., Detroit, Mich.
Tire, 31,248 ea—$2,383,845

VANDYCK CHURCHILL CO., Philadelphia, Pa.
Surface grinder, 2 ea—$69,964

VAPOR HEATING CORP., VAP-AIR DIV., Chicago, Ill.
Spare parts—$102,879

VERTOL AIRCRAFT CORP., Morton, Pa.
Helicopters, spare parts, data—$6,000,000

WARNER & SWASEY CO., New York, N. Y.
Machine, drilling, 1 ea—$33,575

WASHINGTON-IMPERIAL CO., Washington, D. C.
Lathe, engine, 7 ea—$33,443

WAYNE MFG. CO., Pomona, Calif.
Sweeper, rotary, self-propelled, 85 ea—$574,112

WESTERN ELECTRIC CO., INC., New York, N. Y.
NIKE spare parts & components—$2,198,196

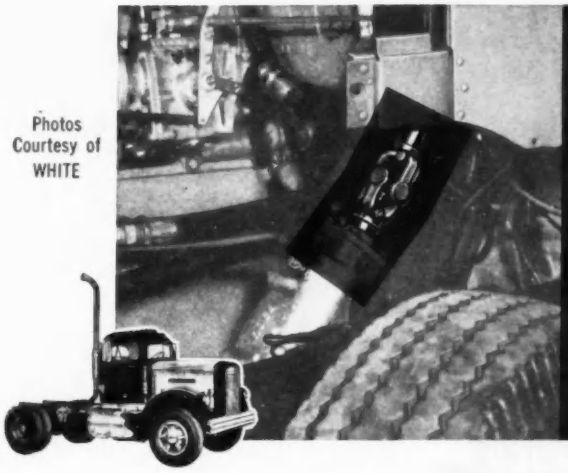
WHITE MOTOR CO., REO DIV., Lansing, Mich.
Trucks—$4,966,977

WILLYS MOTORS INC., Toledo, Ohio
Trucks, 32 ea—$308,037

YALE & TOWNE MFG. CO., MATERIALS HANDLING DIV., Phila., Pa.
Tractor, wheeled, 157 ea—$345,871

YALE & TOWNE MFG. CO., MATERIAL HANDLING DIV., Phila., Pa.
Truck, lift, 67 ea—$489,124

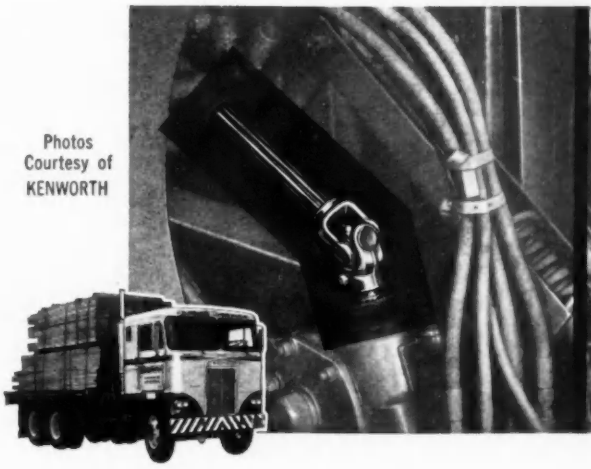
■



Photos Courtesy of WHITE

Photos Courtesy of GMC

To "take power around corners" rely on the Keystone of Quality...



Photos Courtesy of KENWORTH

Photos Courtesy of REO

...select BLOOD BROTHERS Jointed Steering Shafts

On power steering assemblies for famous-make trucks, Blood Brothers Universal Joints "take power around corners" smoothly and dependably. They're widely used on manual steering assemblies too . . . for road-building and construction machines, farm tractors and self-propelled implements.

When you need universal joints to "take power around corners" — or provide for drive shaft flexibility — be sure to consult Rockwell-Standard. Our engineers will gladly assist you . . . and their experience may save money on your project.

K-1C

L6S, L6N

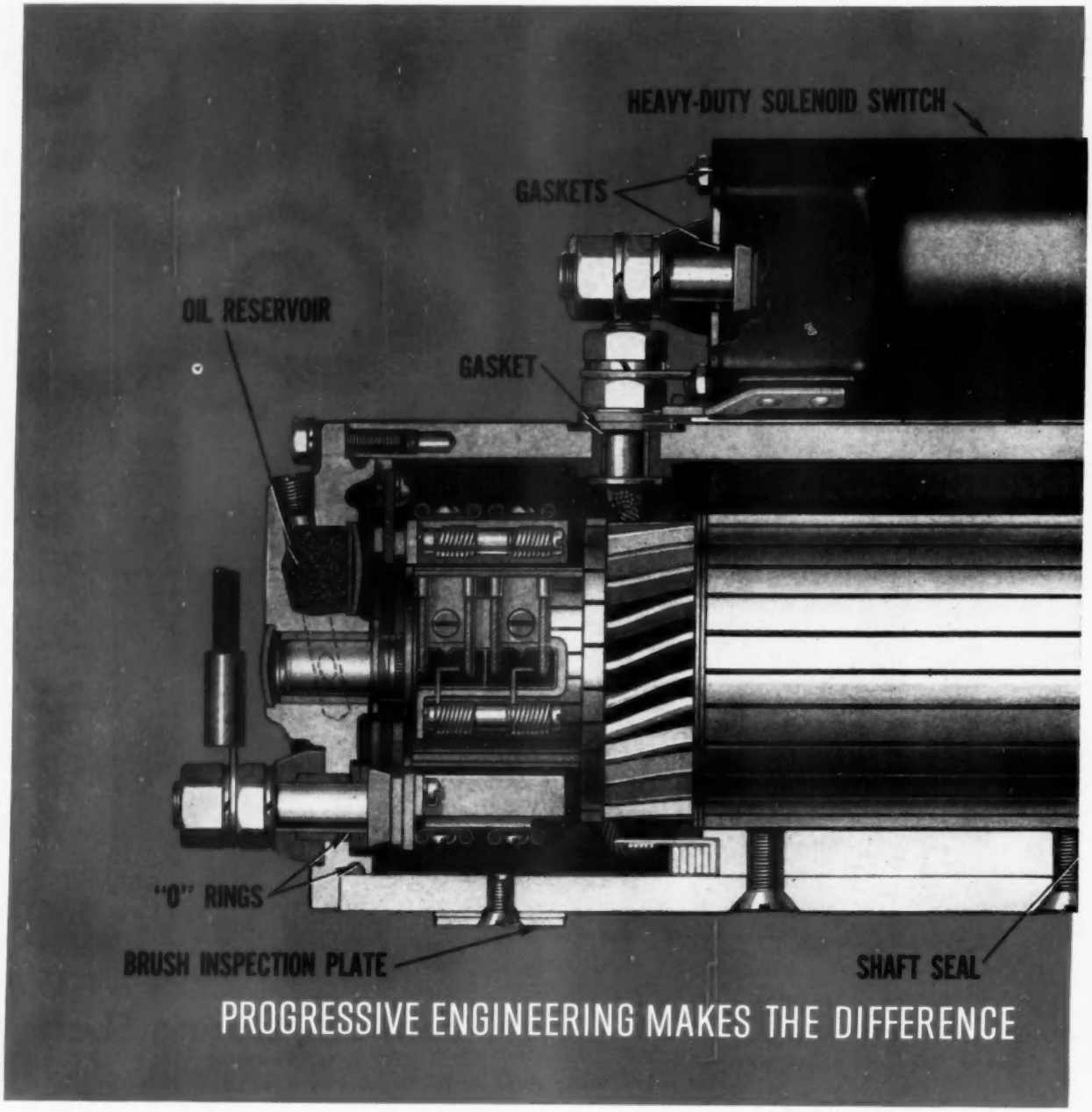
ROCKWELL-STANDARD CORPORATION

ROCKWELL R STANDARD BB UNIVERSAL JOINTS

Blood Brothers Universal Joints

ALLEGAN, MICHIGAN

© 1959, Rockwell-Standard Corp.

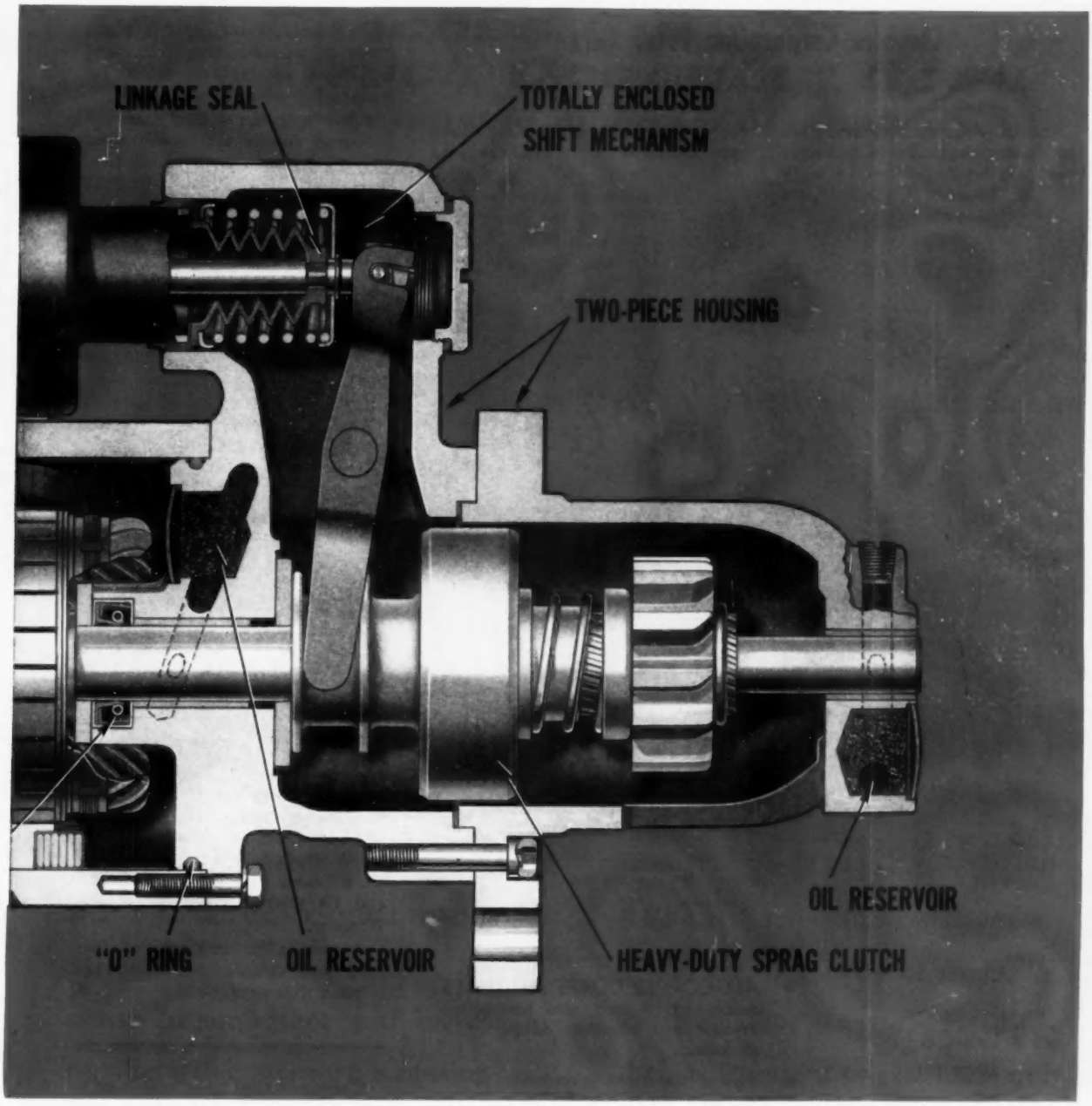


NOW FROM DELCO-REMY——NEW TOTALLY

Delco-Remy now offers a completely new series of solenoid-operated, over-running clutch type heavy-duty cranking motors with the shift mechanism entirely enclosed. Special two-piece drive housings can be assembled to permit a total of 24 different solenoid positions with respect to motor mounting. New 50% longer brushes, together with sealing rings (optional) and large oil reservoirs (optional), assure extra-long operating time between overhauls. And Delco-Remy design features keep these heavy-duty cranking motors positively engaged until the engine starts. Engine manufacturers are invited to write directly to Delco-Remy for complete information and engineering assistance on the application of these new motors.

TOTALLY ENCLOSED DRIVE SHIFTING MECHANISM is protected against dirt, water, slush and ice. This enclosure plus the shaft seal and linkage seal also prevents transmission oil leakage.

TWO-PIECE DRIVE HOUSING DESIGN permits 24 different solenoid positions. Nose housings available in S.A.E. #2 and #3 mountings.



ENCLOSED HEAVY-DUTY CRANKING MOTORS

HEAVY-DUTY SOLENOID AND SWITCH provide positive pinion engagement and safely handle maximum starting current. Special seals increase contact life.

SPRAG CLUTCH DRIVE operates with non-chamfered ring gear. Pinion indexes on spiral spline, positively engages ring gear before power switches on, and does not become disengaged with sporadic engine firing.

HEAVIER BRUSH INSPECTION PLATES resist damage from use and handling—are sealed to prevent leakage to motor interior.

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

GM GENERAL MOTORS

ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

Circle 151 on Inquiry Card for more data

Chrysler Corporation 1960 Cars

(*Continued from page 58*)

Another change in the brake system is the adoption of a foot-operated parking brake located under the left side of the instrument panel.

SOUND DEADENING

GREAT strides have been made in sealing and silencing the new cars. In an average car there are about 87-lb of sealers and sound-deadeners, exclusive of some 36-lb of undercoating. Transmission of noise from the engine compartment has been reduced by providing just a single opening in the firewall for the entry of wiring harness, speedometer cable, transmission cable main wiring, heater and air conditioning controls. Each group is encased in vinyl collar and the entire assembly is sealed by means of a polyethylene cap.

A newly developed fluid deadener is spread thickly and evenly over the upper part of the floor pan. Above this, in nine critical areas, heavy mastic felt padding is inserted in the panels. Sound deadening materials then are sprayed under the floor and in the wheel wells. The front floor compartment is covered with jute matting ¾-in. thick while the rear floor area is covered with a slightly thinner mat. Side cowls get special sound-deadening treatment while the roof panel is provided with a ½-in. blanket of insulation.

A sponge rubber base sealer is forced into all joints and creases. It has the facility of expanding while heated in the paint drying ovens.

SPECIAL ACCESSORIES

THE new line offers a variety of special accessories which include: a four - light emergency flasher system to warn that the car has been stopped for servicing; improved captive air tires containing a shield of wire cord within the casing to keep the tire from deflating even though the outer casing has been punctured; coordinated windshield washer, optional on all cars, standard on Imperial and Chrysler models, except the Windsor.

A new safety and comfort feature is an optional two-speed rear window defroster. ■

Congress next year will take a long, hard look at methods the free world can use to combat the growing threat of Soviet economic warfare. Russian cold war strategy is focusing increasingly on the economic front, particularly on underdeveloped countries. Offers of cut-price trade goods could dry up traditional free world markets, and cause serious hardships, the lawmakers believe. The answer may be joint free world action.

FOR DEPENDABLE All Weather COOLING

Install EUREKA RADIATORS

Over 30 years of specialization and engineering research have produced a radiator and core proved dependable under all conditions.

We Invite INQUIRIES ON Complete Radiators FOR ALL INDUSTRIAL APPLICATIONS

- **ALL-COPPER CORES and TUBES** double-lock seamed give greater strength and eliminate danger of rusting
- 1-piece upper-and-lower-tank brass stampings for **POSITIVE PROTECTION FROM LEAKAGE AND VIBRATION . . .**
- Large tube area for **EFFICIENT COOLING IN ALL WEATHER,** all driving conditions . . .
- **GUARANTEED** against defects in materials and workmanship.

EUREKA

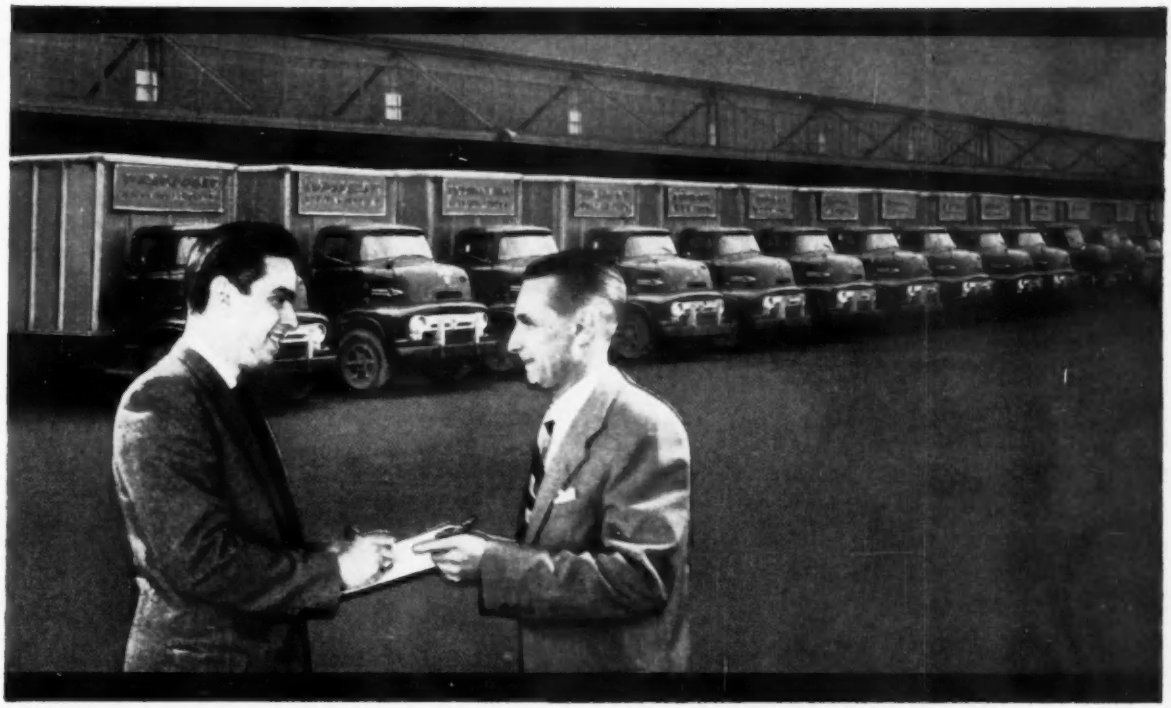
WRITE TODAY FOR DETAILS

AUTO RADIATOR Manufacturing Co.

2901-17 INDIANA AVE. • CHICAGO 16, ILLINOIS

LIPE Clutches Cut Truck Operating Costs

say increasing numbers of big users...



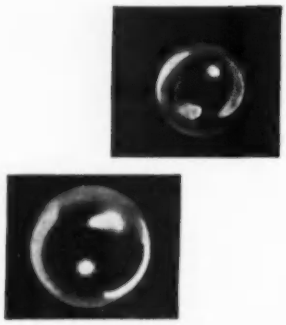
IT's what the clutch does on the road that sells the experienced truck user. His only measuring stick is overall costs. In important and increasing numbers, that measure is causing him to buy Lipe Heavy-Duty DPB's . . . both on new trucks and as replacements of original equipment.

Don't risk the owner loyalty of this big and growing body of users. Sell them what they want . . . LIPE . . . either as standard or optional equipment. Let the men who pay the bills prove to you that . . .

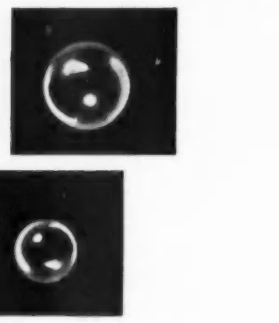
the trend is to LIPE.

For more ton-miles and more engagements between shop-stops, equip with Lipe Heavy-Duty DPB Clutches. Single and two-plate types; 12", 13", 14" and 15" sizes: torque capacities from 300 to 1900 ft.-lbs.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.



WHEN
IT COMES TO
BALL BEARINGS . . .



ALWAYS
COME
TO . . . BCA

Here at BCA you'll find a number of things that work to your advantage. Production flexibility—even when everyone wants everything right now. Ability to fulfill unexpected needs for special engineering. A real appreciation of a supplier's obligation to meet "when-promised" delivery dates. Pride of workmanship stemming from 50 years' experience in the design and production of quality ball bearings. All these pay off for BCA customers. They will pay off for you when you come to BCA for your original equipment and replacement ball bearing needs. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

BCA BALL BEARINGS

BEARINGS COMPANY OF AMERICA
DIVISION OF
Federal-Mogul-Bower Bearings, Inc.

Ford's Falcon Axle

(*Continued from page* 65)

milling machine with an indexing table. The first operation is the slab-milling of the large face. This is followed by drilling, chamfering, and double-reaming of two manufacturing locating holes at extreme ends of the milled face. These holes are held accurately on centers—10.501-10.499-in. These locators, plus the milled face which is held flat, constitute the positive location in all subsequent machine fixtures.

The final step in the Ingersoll, at the third head, is the milling of four bearing cap joint faces.

When it comes to cross boring operations, Ford production engineers have decided to abandon the former practice of employing the familiar three-way precision-boring equipment. Alignment and concentricity have become so important in producing accurate gear and bearing fits, that they now prefer to have a single spindle bore through both ends, instead of having spindles come in from opposite ends. Naturally, this is quite feasible on this small housing.

Rough-boring and chamfering of tube bores as well as facing of the ends is done in an Ex-Cell-O two-way (right-angle), four-spindle precision-boring machine. This is followed by drilling of the eight cover holes; drilling of four bearing cap holes; chamfering of the 12 holes; tapping of all holes; drilling of weld holes in the end; and drilling and tapping of the drain hole. This group of operations is performed in individual machines.

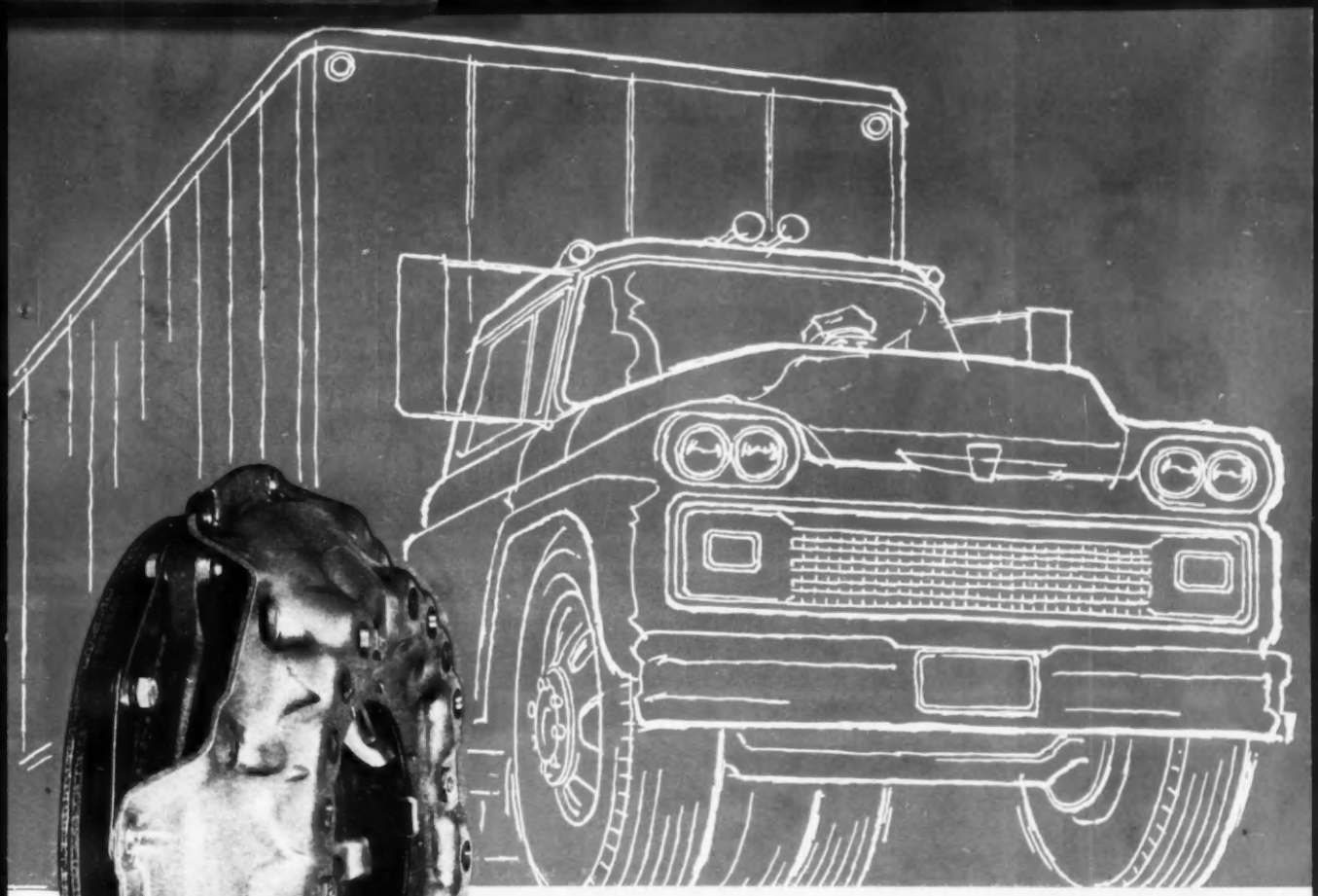
Following these preparatory operations, the two bearing caps are attached to produce the carrier housing assembly in readiness for final finishing.

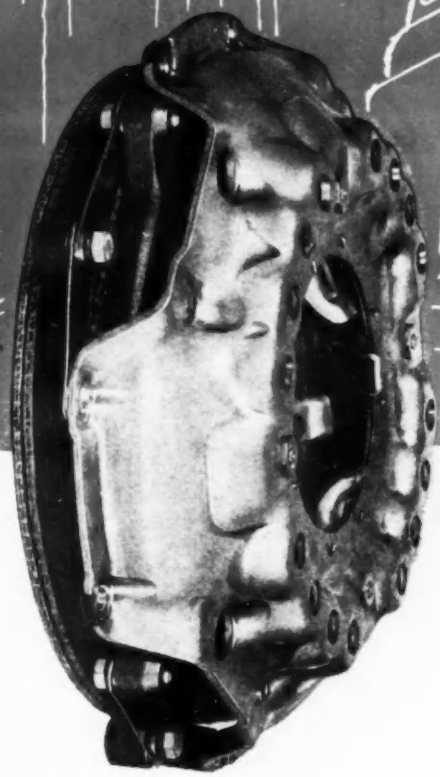
First operation is the finish-boring of the tube ends, this being done in two-way, Ex-Cell-O and Heald precision-boring machines. Bore is held to 2.736-2.739 in. This does not include bearing bores.

Next is one of the new items of equipment, a four-way Snyder precision-boring machine. In this setup they rough bore and chamfer the bearing diameters in one plane

(*Turn to page* 112, *please*)

Circle 154 on Inquiry Card for more data





New BORG & BECK 2-Plate "Strap-Drive" Clutches

PACK MORE MUSCLE...WITHOUT ADDED SIZE

Trucks pay out on the road, not in the shop. So it's asking for trouble when a truck engine is too big for its clutch.

To help keep 'em rolling, Borg & Beck has developed a new line of 2-plate clutches with up to 40% greater load capacity . . . yet without any increase in nominal size.

Rated at 500 ft.-lbs. torque capacity, this new Borg & Beck Type 13E2 has 12⅞" O.D. x 7¼" I.D. facings . . . non-cushion rigid or flexible center drive plate . . . space for 16 heat treated coil springs of total load to suit type of service . . . "strap drive" for positive, trouble-free plate separation.

And like all Borg & Beck clutches, Type 13E2 is built to Borg & Beck's pace-setting standards for quality, performance and value. Consult our engineers for details.

BORG & BECK CLUTCH — THE STANDARD

Reg. U.S. Pat. Off.

BORG & BECK B-W BORG-WARNER ®

BORG & BECK®

THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3

Circle 155 on Inquiry Card for more data

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Ford's Falcon Axle

(*Continued from page* 65)

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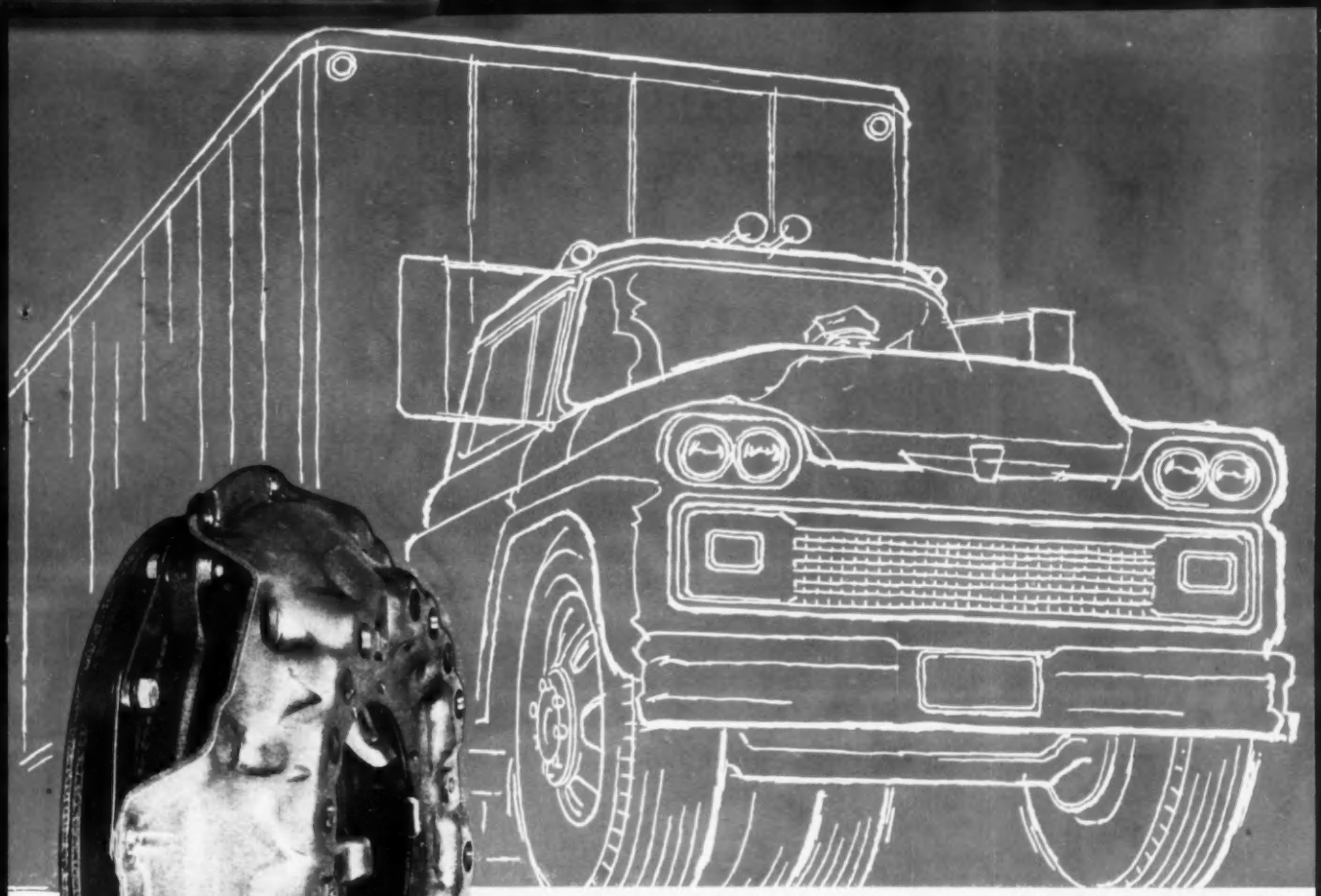

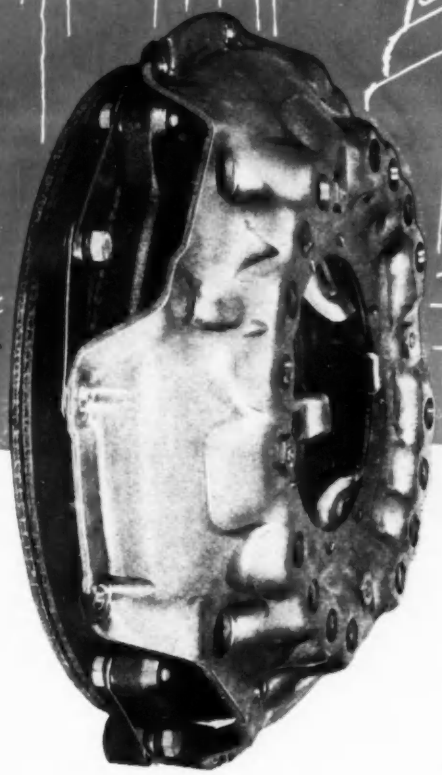

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BORG & BECK CLUTCH · THE STANDARD

Reg. U.S. Pat. Off.

BORG & BECK · B-W · BORG-WARNER ®

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THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3

Circle 155 on Inquiry Card for more data

FOR TOP
PERFORMANCE
EVERY TIME

ONLY RAMCO MAKES BOTH TYPES OF MODERN RETAINING RINGS

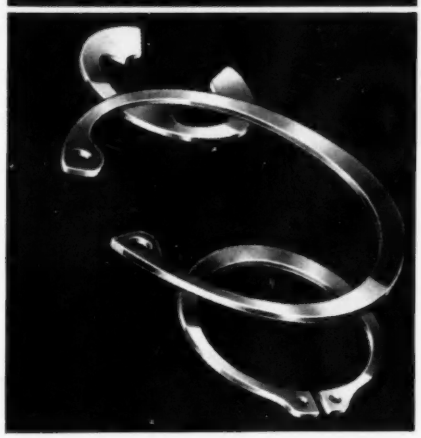
***Retaining Rings by* THOMPSON PRODUCTS**

another product of ***Thompson Ramo Wooldridge Inc.***

PERFORMANCE? ASSEMBLED COST? APPEARANCE?

WHAT IS YOUR MAJOR FASTENER PROBLEM?

If it is performance, Ramco retaining rings will give you the one best answer!



SpirOlox

A time-tested Ramco design; full-circle 360 degree retaining ring opens up unlimited possibilities for improved design and economies in thousands of new or present products.

- √ Uniform wall allows installation with minimum clearance.
- √ Two turn, full-circle design eliminates gaps.
- √ No special tools needed for installation or removal.
- √ No tooling needed for prototypes—complete design flexibility.
- √ Develops a unique "friction lock" under load.
- √ Always uniform in quality.
- √ Special designs for high speeds or tolerance stack-up problems.

CircOlox

The answer to easy, lightweight, low cost assemblies and reduced manufacturing costs. Made in a variety of types and sizes for the smaller shaft or housing diameters.

- √ "Deep-groove" design permits maximum thrust with minimum weight.
- √ Easily installed or removed.
- √ Available in a variety of materials.
- √ Wide choice of finishes.
- √ Always uniform in quality.
- √ Meets Government and Industry Standards.

Only Ramco makes both types of modern retaining rings . . . both engineered for peak performance . . . ample safety for thrust load . . . rings that won't be sloppy in the groove . . . that can't jump out . . . that are dependable, dynamically balanced and made in a wide range of designs, styles, materials and finishes.

You're further assured of top performance because Ramco Rings are manufactured in the world's most modern ring plant . . . designed to the highest engineering standards established by Thompson Products and Ramco . . . the same engineering skill that serves the nation's car factories, aircraft builders, missile and electronic manufacturers.

Send us a blueprint of your toughest retaining ring problem. We'll send you the one best answer to your problems of increasing performance, cutting assembled cost, or improving appearance. A special Retaining Ring engineering Catalog and Price Lists are yours without cost or obligation. Why not mail the coupon today for your copies?

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Box 513, Dept. H, St. Louis 66, Mo.

Send latest Engineering and Price Catalogs of Spirolox and Circolox Retaining Rings.

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Samples Wanted: Spirolox ☐ Circolox ☐ Size.....

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Our credo for serving America's giant manufacturing industry is simply stated: "Give the GENTLEMAN what he wants"

(*Continued from page* 108)

to 2.521-2.529-in., then machine pinion bearing and seal bases from one end. This includes rough-boring and chamfering the inner and outer pinion bores; oil seal bore; facing the pinion boss; and finish counterboring.

This is followed by semi-finish-boring of the bores mentioned above plus finish-boring of the thread diameters in the bearing bores. A four-way Ex-Cell-O precision boring machine is used for this purpose.

The 2⅝-in.-16-UN 3B thread in the bearing cross bores is produced on a Model B Natco two-spindle axially-opposed threading machine.

Final major operation is completed in an Ex-Cell-O two-way (right angle) precision boring machine. The bearing cross bores with caps in place, finished to 2.5637-2.5647-in., are required to be held square with the pinion within 0.003-in. at a radius of 9.00-in. in any plane. The bores, in turn, must be concentric within 0.002-in. total indicator reading.

At the same time the bores in the pinion end are finished to the following tolerances: the two outer bores are held 2.622-2.624-in., and 2.5297-2.5307-in., respectively and concentric within 0.002-in. total indicator reading. The inner bearing bore is held to 2.8428-2.8438-in. and must be concentric with the outer bearing within 0.001-in. total indicator reading. Both bearing shoulders must be held square with bearing bores within 0.0004-in. and runout held within 0.0005-in.

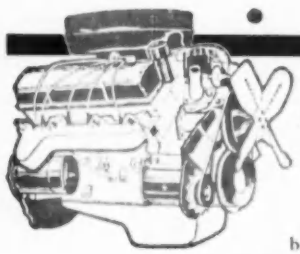
Other major components such as gears, shafts, and tubular ends are produced on substantially the same equipment as is used for similar Ford parts. The tubular ends, in particular, are formed and swaged in conventional Ford manner, then are cut to proper length and fitted with the end flange and spring pad. Then the tube sub-assemblies are transported to a group of two new LaSalle machines for finishing operations—one machine for the right-hand tube, the other for the left-hand tube.

LaSalle machines, as illustrated, are of double-end trunnion type with six stations. At one end they face and turn the tube end; at the other end they face and bore the flange, and drill flange holes. Except for manual loading and unloading, these machines have a fully automatic cycle.

We mentioned earlier that the carrier assembly was made up before completing the axle housing assembly. This is done on a small conveyor assembly line in a manner similar in all respects to that for other Ford axles.

It is important to note in connection with the production of the Falcon axle that quality has been tightened materially with the start of 1960 car production. Best evidence of this is the insistance upon the sampling of tolerances noted above together with clamping down on limits for concentricity and alignment. We were told that no deviations will be tolerated which means that any deviations will be subject to rejection. This may be the dawn of a new day for better quality. ■

JOHNSON *tappets*



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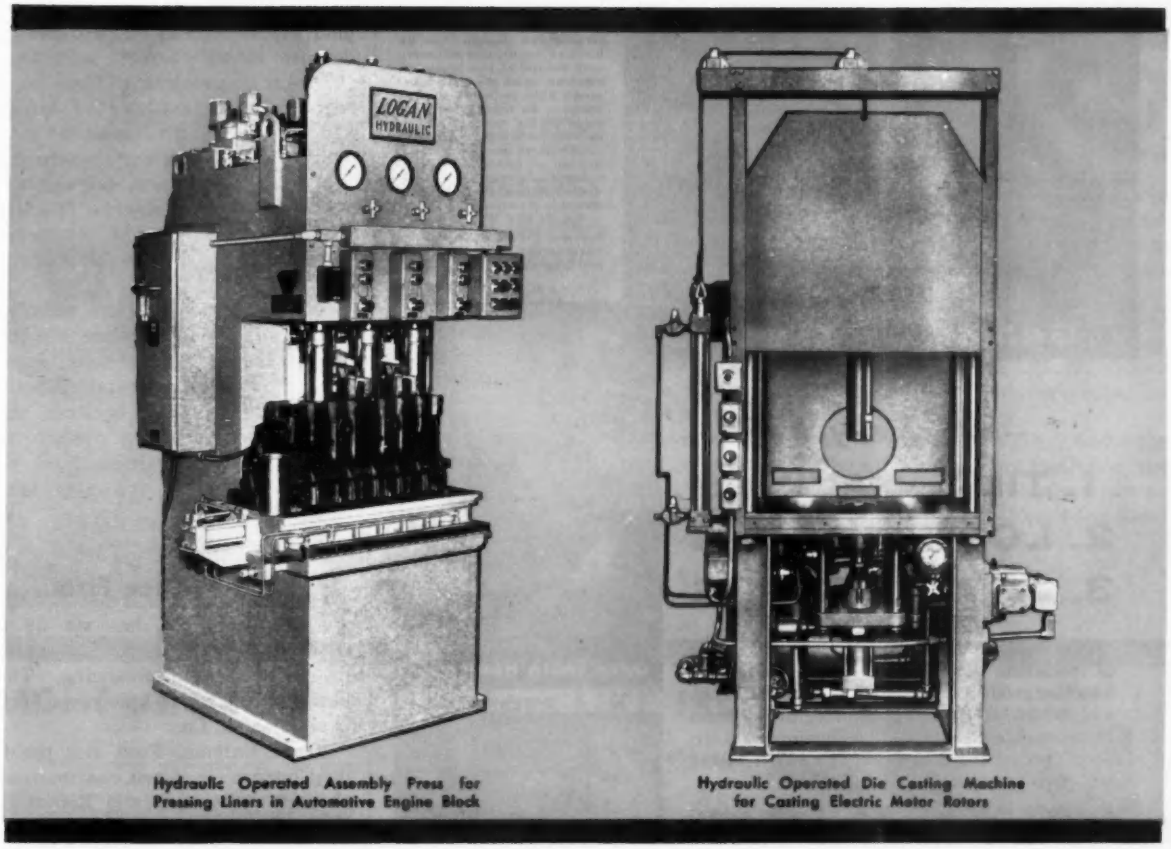

Hydraulic Operated Assembly Press for Pressing Liners in Automotive Engine Block

Hydraulic Operated Die Casting Machine for Casting Electric Motor Rotors

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Logan

MEMBER: Natl. Mach. Tool Builders' Assn.: Natl. Fluid Power Assn.

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FAIRFIELD FACILITIES ... at Your Service

Left — High accuracy balancing of rotating parts, including unusual off-center and counterweighted designs, can be handled rapidly and efficiently with the aid of this ingenious machine which utilizes stroboscopic light to locate the unbalance, an electric meter to measure the amount of unbalance, and a drill, mounted integrally, to remove indicated amount of metal for desired balance — followed by immediate inspection — all completed in a single handling.

Below — Other examples of specialized equipment "at your service" at FAIRFIELD.

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1. TIME SAVINGS
2. LOWER COSTS
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At Fairfield, YOUR GEARS are in the hands of specialists equipped with every facility for handling production RAPIDLY, EFFICIENTLY, and ECONOMICALLY. Special or unusual requirements in design, size, finish, tolerances, processing, materials, and heat treating are often "standard" at FAIRFIELD.

Fairfield's gearmaking facilities save capital investment for many builders, large and small, of power driven equipment. At Fairfield, you get the benefits of high production rates and big volume output in an ultra-modern plant designed exclusively for producing fine gears. *Become a Fairfield customer; it pays!* CALL OR WRITE.

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MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

AIRBRIEFS

(*Continued from page 90*)

Liquid gold solutions are sprayed or "painted" on vulnerable surfaces, and, after baking, a metallic film, four millionths of an inch thick, is left.

R. T. Hopper, vice president of Engelhard Industries, Inc., a supplier of precious metal products to defense manufacturers, said that the abrasion-resistant film is a highly efficient reflector of infrared radiation and reduces the rate of heat transfer on engine shrouds, drag-chute containers, tailcone assemblies and blast shields. The film allows the use of light structural components and its weight is negligible, he added.

Some of the planes and missiles protected by gold solutions are the F-100, F-101, the Redstone, Jupiter, and Polaris. Depending upon the particular vehicle involved, the metallic solutions are applied to porcelain-enamel stainless steel, fiberglass laminates and other heat resistant materials. ■

Ford Finance Firm

Ford Motor Co. has set up a wholly-owned subsidiary for automobile credit and financing. The new corporation is known as Ford Motor Credit Co.

T. O. Yntema, Ford vice president-finance, is board chairman of the new subsidiary and Robert S. Olson, formerly head of the dealer financing office, is president. Olson at one time was affiliated with Universal C.I.T. Credit Corporation.

Ford Motor Credit Co. will offer direct competition to General Motors Acceptance Corp. for customer credit. The Ford announcement followed word that the Senate has postponed until next February any action on bills to prohibit automobile companies from financing their own products.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

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Circle 160 on Inquiry Card for more data →

ADVANCED DESIGN PISTONS

By GILLETT AND EATON

for Longer Heavy Duty Service

TROUBLE-FREE with thousands in use

★ Low initial cost ★ Low cost per mile

★ Amazing increase in piston life

★ Maintains new engine power and performance

G and E WIRE INSERTS PUT CAST IRON WEAR IN TOP RING GROOVE

G and E Wire Insert Piston before machining (left) and after ring grooves are cut (right) showing how the steel wire forms a tough wear-resisting surface on both faces of top ring groove. The patented ferrous plug molded in the head (for diesel pistons) prevents burning through head and lengthens diesel piston life!

With the thousands of G and E "Wire Insert" Pistons in use for periods up to 3 years—a phenomenal record for trouble-free operation has been established. The "Wire Insert" greatly reduces top ring groove wear and increases piston life.

The "Wire Insert" piston design—exclusive with G and E—combines all the advantages of aluminum alloy pistons with the long life of steel in the top ring groove lands. No noticeable increase in weight—unequalled for rapid heat flow—and at low cost.

A pre-shaped steel wire is cast into the piston where the top ring is located. When the grooves are machined, the closely spaced wire surfaces form hard bearing areas on top and bottom faces of the groove. Result—reduced ring land wear, longer piston life at lower cost.

Get the G and E Wire Insert story today.

as LIGHT as aluminum . . . wears LIKE IRON

VANASIL*

"OIL-ABSORBING" PISTONS FOR GASOLINE AND DIESEL ENGINES

*Gillett & Eaton's trademark for a Hyper-eutectic Silicon Aluminum Alloy

VANASIL Pistons have repeatedly run way over 200,000 miles with only .002" to .005" wear on the top ring grooves. On-the-road ring breakdowns caused by badly worn grooves are almost eliminated because *Vanasil Pistons reduce top ring groove wear up to 75%!* Nothing else compares with the genuine G & E Vanasil—the original high silicon alloy, proven by 19 years of use.

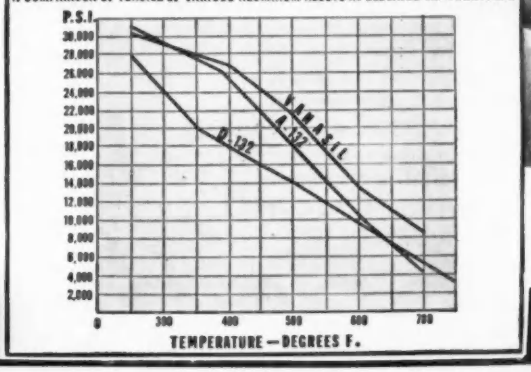
You Get ALL These Advantages Only In

GENUINE VANASIL PISTONS

G & E PROVED Hyper-eutectic Silicon Aluminum Alloy

1. LIGHT WEIGHT—Same as other aluminum alloys.
2. SCORING, SCUFFING MINIMIZED—Because of "Oil Absorbing" microscopic porous texture.
3. LONGER LIFE—30% less friction—30% harder. Greater "hot strength"—see chart at right.
4. TOP RING—Breakage virtually eliminated because of reduced ring groove wear.
5. LOW EXPANSION—Characteristics of Cast Iron.
6. CLOSE CLEARANCES—Fitted with Cast Iron Clearances.
7. SOLID SKIRT DESIGN—No expansion devices required.
8. HIGH HEAT CONDUCTIVITY—Similar to other aluminum alloys.
9. PLATING—No tin or other break-in coating required.

A COMPARISON OF TENSILE OF VARIOUS ALUMINUM ALLOYS AT ELEVATED TEMPERATURES



Write for complete information and prices on Gillett and Eaton's Wire Insert and Vanasil longer lived pistons.

"Our 91st Year"

GILLETT and EATON, Inc. 841 DOUGHTY STREET LAKE CITY, MINNESOTA

MEN *in the* NEWS

(Continued from page 86)

Yale & Towne Mfg. Co., Materials Handling Div.—**E. D. Hoben** was named chief engineer, government contracts.

Studebaker-Packard Corp.—**W. D. Mewhort** was elected vice-president in charge of diversification activities.

Minneapolis-Honeywell Regulator Co., Brown Instruments Div.—**W. F. Newbold** was made director of research.

Aeronca Mfg. Corp., Electronics Div.—**C. W. Harvey, Jr.,** was named sales manager.

Mobay Chemical Co. — **P. W. Mitchell** was appointed manager of technical service for Merlon polycarbonate resins.

Arvey Corp.—**W. F. Rossiter** was named director of automotive products development.

Scovill Mfg. Co., A. Schrader's Son Div. —W. C. Manville was named manager of the Akron, O., branch and D. C. Baker division general sales manager.

American Bosch Arma Corp.—**W. P. Smith** has been named a vice-president.

Aerojet-General Corp.—**J. M. Beauchamp** was made director, Customer Relations Div.

Oliver Corp.—**C. A. Hart** was made director of dealer relations.

Enjay Co., Inc.—C. E. Farnsworth was made product manager, plastics.

Eastman Mfg. Co.—**A. G. Homer** is now in charge of organizational planning and development.

LeTourneau - Westinghouse Co.—**D. K. Heiple** has been named manager of a newly formed Sales Development Dept.

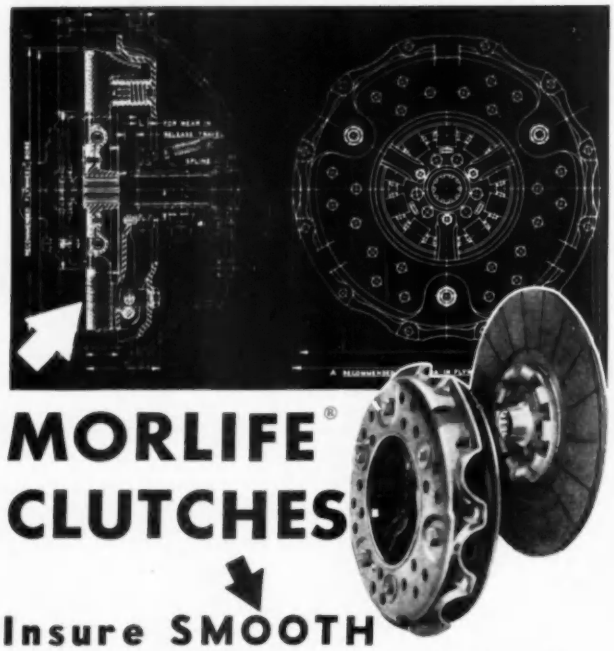
United Aircraft Products, Inc.—**G. E. Campbell** was appointed vice-president of manufacturing.

Holley Carburetor Co.—R. W. Carbary is now director of purchasing for all Holley plants.

AMC's Mobile Schools

American Motors has put a fleet of mobile service training schools in operation to train dealer mechanics on the spot. The schools are 35-ft trailers equipped with work benches for 12 men. Axles, transmissions, air conditioning systems, power steering, power brake units, and other components are worked over right in the trailer.

ROCKFORD



MORLIFE® CLUTCHES

Insure SMOOTH

Powerful Pick-Up in Heaviest Going

Compared to previous type friction plates, Morlife® Clutches reduce foot pedal pressure up to 50%. They assure positive engagement—with power-holding grip. Provide a degree of heat resistance and dissipation never before available. They give several times the durability for prolonging clutch life and extend the time between pedal adjustments many times as long.

See us in Booths No. S-1 to S-16 at the Milwaukee S.A.E. Convention

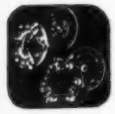
SEND FOR THIS HANDY BULLETIN

Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER

315 Catherine St., Rockford, Ill., U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.



Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

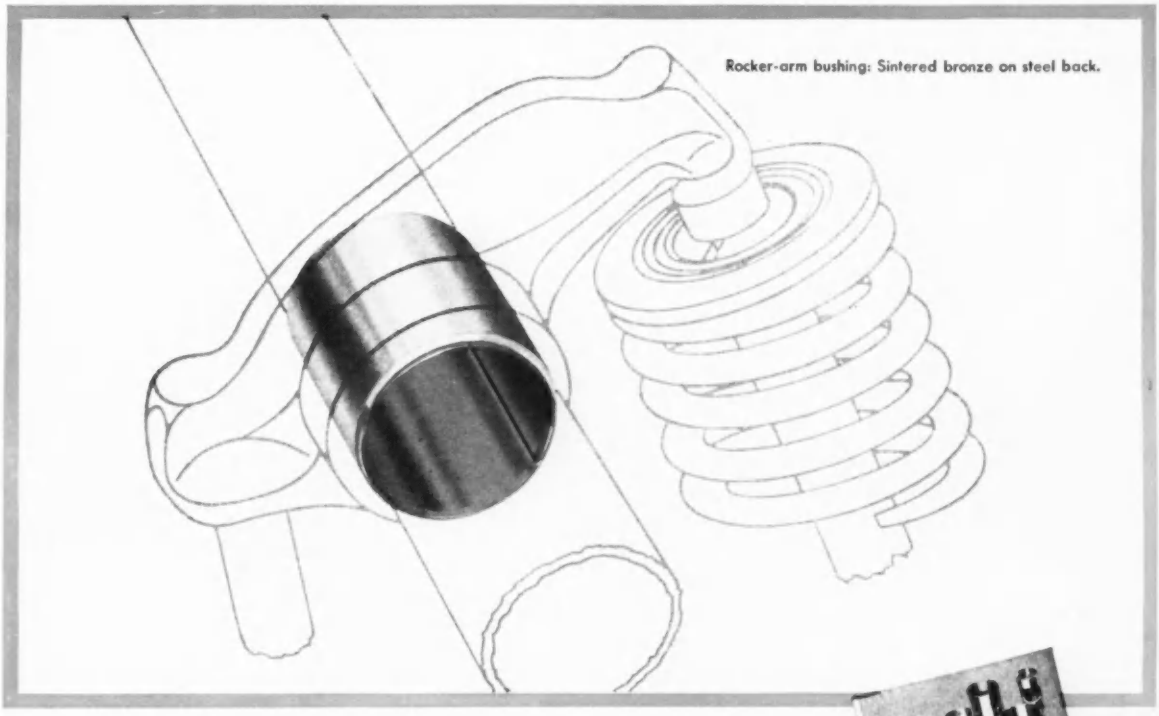
Speed Reducers

CLUTCHES

Carrying the rocker-arm load . . .

FORMED BUSHINGS

SAVE SPACE—SAVE WEIGHT—SAVE COST!



Rocker-arm bushing: Sintered bronze on steel back.

Here's a typical application in which the design engineer uses formed bushings to meet both performance and cost demands.

This rocker-arm bushing is formed from sintered bronze-on-steel strip. In fast oscillation, at 200 p.s.i. average loading, it has an average life of 5,000 hours, or 150,000 miles. Cost-wise, you will find it attractive. Space and weight are saved, with no sacrifice of strength or service life.

There are countless other applications in motor, machine and accessory design, where formed bushings deliver equal satisfaction. Let our engineers assist you. Consultation is free—no obligation.

FREE!

Bushing Design Guide, technical publication by our Engineering Department. Shows materials, size standards, design and application features. Write today!

FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

Copper-Alloy Lined Bearings

Spacer Tubes

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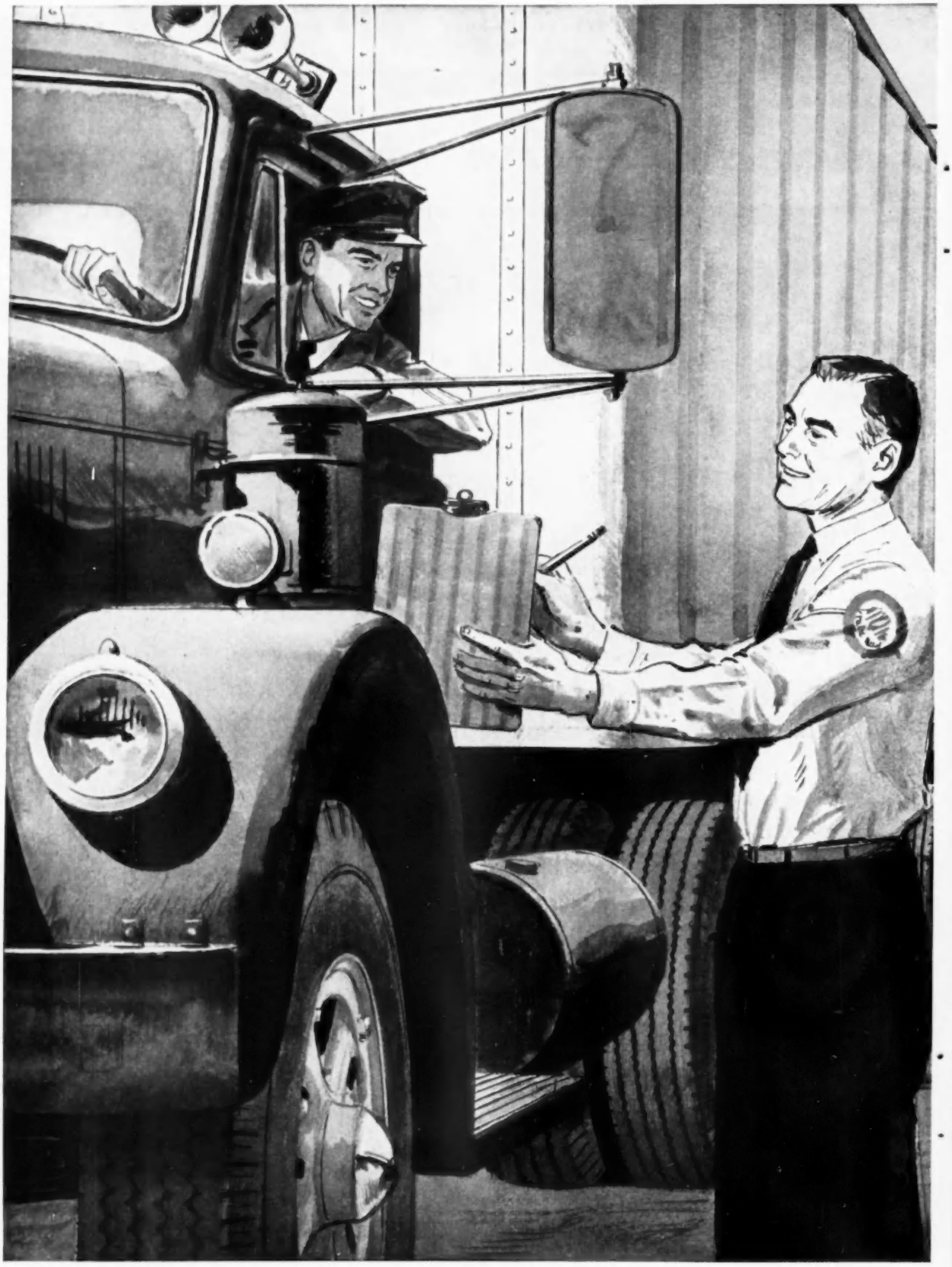
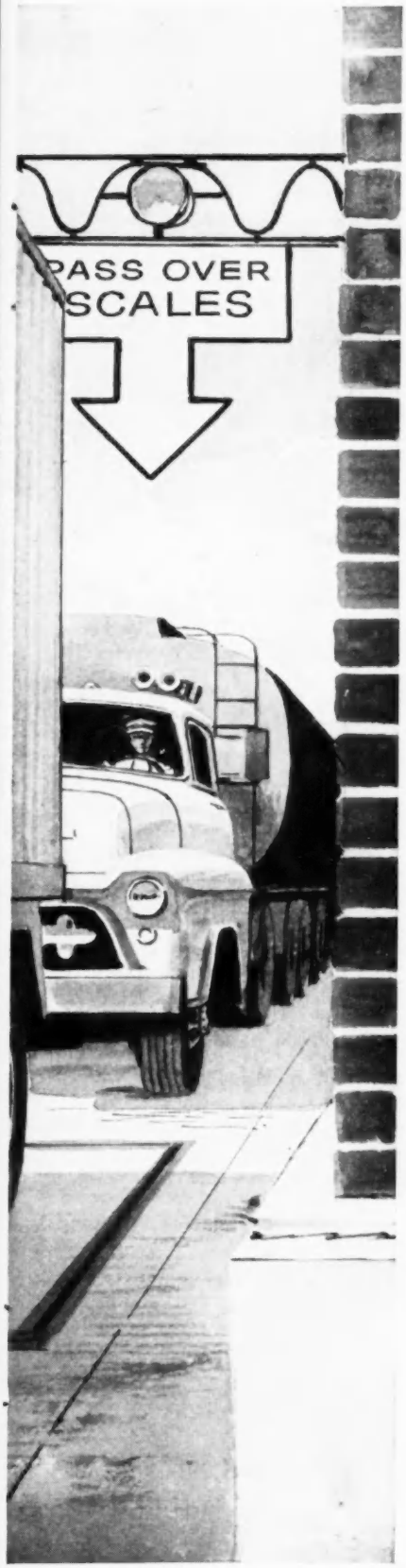
Precision Thrust Washers

FEDERAL Mogul SINCE 1899





Reduce maintenance, lower GVW, add payload with

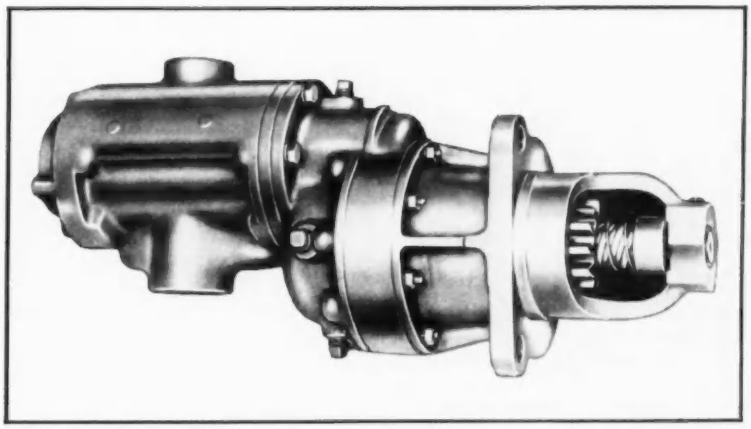
BENDIX-WESTINGHOUSE AIR STARTERS

You can reduce maintenance and add as much as 250 extra pounds of profit-making payload per run! Simply specify a compact Bendix-Westinghouse Startaire* air starting motor on your next new-vehicle order. You'll eliminate the weight and costly maintenance of heavy-duty batteries, oversized generators, switches and cables of an electrical starting system. With Startaire a light battery will suffice for all electrical needs giving you substantial savings on battery recharging and replacement costs.

Designed for use on air-brake-equipped vehicles, Bendix-Westinghouse air starting motors give gasoline or diesel engines fast-action, trouble-free starts under all weather conditions. A dependable Bendix-Westinghouse compressor provides an ample supply of compressed air for both the starting and stopping systems.

So whether you're starting a vehicle—with a Bendix-Westinghouse Startaire . . . or stopping it—with a Bendix-Westinghouse Air Brake system . . . you can rely on the Bendix-Westinghouse reputation for high quality, dependability, long life. Call us today, or write for full information on the money-saving, profit-making Bendix-Westinghouse Startaire.

*REG. U.S. PAT. OFF.



Two Startaire models available for all engine sizes: moderate duty for cranking engines up to 1100-cu.-in. displacement; and a heavy-duty model for engines over 1100 cu. in.

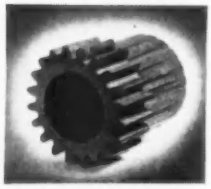
Bendix-Westinghouse

AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.

No one wants to hear the gears turning!

A TAYLOR laminated plastic gear is noiseless, acts as a safety valve in a gear train



You can solve two problems with a single gear made from TAYLOR laminated plastic silent gear stock. Noise of meshing gears can be eliminated. Damage due to destructive overloads can be localized to protect the rest of the gear train and equipment. And the laminated plastic gear will outwear metal under normal operating conditions. Look into the physical and mechanical properties of TAYLOR laminated plastic silent gear stock. It is adaptable to a wide variety of applications. Write TAYLOR FIBRE CO., Norristown 49, Pa.

Taylor

LAMINATED PLASTICS VULCANIZED FIBRE

MACHINERY NEWS

(Continued from page 88)

Around the Industry

Van Norman Machine Co.—George P. Burns has been appointed sales manager, machine tools.

R. K. LeBlond Machine Tool Co.—Vincent W. Stehlin, former purchasing agent and assistant general manager of The Fosdick Machine Tool Co., has moved up to the position of assistant purchasing agent of Fosdick's parent company.

Fosdick Machine Tool Co.—Charles A. DeVries, former plant engineer, has become purchasing agent and assistant to the president.

E. W. Bliss Co.—Richard J. Dietz has been appointed district sales representative for Northern Ohio and Indiana. He will assume the duties formerly handled by E. C. DeVault, who has been named to the new position of service manager, Mid-West area, which includes the Detroit and Dayton territories.

Warner & Swasey Co.—the appointment of Robert L. Groves as administrative assistant, Sales Dept., was recently announced by L. M. Cole, vice-president. Groves returns to the U. S. from Paris, France, where he served as European district manager for the company.

Marshall & Huschart Machinery Co.—Robert W. Schoeffler has been appointed field sales manager, and in his new position will coordinate all field sales and service facilities of this machinery distributing organization.

Baker Brothers, Inc.—is making plant-side demonstrations of its new 12-ton drilling and tapping machine by transporting the machine on a wheeled low-platform trailer.

Norton Co.—recently commemorated the 50th anniversary of *Grits and Grinds*, the well-known and widely-read company technical publication devoted to articles on grinding, lapping and surface finishing. ■

Columbium steel...

solves stamping problems

The cold formed stampings illustrated above are made from Great Lakes' Steel Corporation's GLX-W series of columbium steel. It clearly demonstrates the possibilities that are available to designing engineers. Here can be found high yield strength, with its possible weight reduction, good weldability and satisfactory impact properties. To be able to cold form these parts demonstrates the excellent properties to be had and points to possible production savings.

Molybdenum Corporation, through its own basic research and in close cooperation with various steel companies, has pioneered in the application of columbium to flat-rolled steels. For technical assistance in adapting these steels to your production, consult direct with your steel supplier or address your communication to MCA. No obligation, of course.

MOLYBDENUM

2 Gateway Center CORPORATION OF AMERICA **Pittsburgh 22, Pa.**

Offices: Pittsburgh, Chicago, Los Angeles, New York, San Francisco
Sales Representatives: Brumley-Donaldson Co., Los Angeles, San Francisco
Subsidiary: Cleveland-Tungsten, Inc., Cleveland
Plants: Washington, Pa., York, Pa.

MCA

Circle 166 on Inquiry Card for more data

When it comes to . . .

TETRASEALS

Go Goshen

If you haven't discovered TETRASEALS, you'll be amazed at the ways these rectangular-section rings can save you money and render outstanding performance . . . for static, and even some moving applications. Interchangeable with standard O-rings, TETRASEALS use the same groove, require no special tooling, and are one-piece (non laminated).
Remember, only Goshen can supply TETRASEALS, to supercritical tolerance, in natural, synthetic and silicone compounds to meet MIL, AMS, SAE, ASTM and industrial specifications.

Let a Goshen representative explain the cost and function advantages of TETRASEALS to you, or write for Technical Bulletin No. 11.

Goshen Rubber Co., INC.

2799 S. TENTH ST. GOSHEN, INDIANA

IHC Engine Plant

(*Continued from page* 68)

2; 10 holes at the RH head. It may be noted that many of the long holes are drilled part way through in several passes at different stations. Station 3 RH drills seven holes. Station 4 LH drills two angular holes; RH head has six working spindles. Station 6 LH has 13 spindles, RH nine spindles. Ten holes are drilled by the LH head at Station 7; 15 holes at the RH head. Station 8 LH has eight spindles; RH, 11 spindles. Ten spindles are at work at Station 9 LH; while the RH head has an attachment for blow-off and probing of 17 holes.

Station 10 core-drills two holes; taps one. At Station 11 the head is turned 90 deg to present it with rocker arm face up. Station 12 LH drills 12 holes; RH drills five holes. Twelve holes are chamfered at the LH head of Station 13; while the RH head chamfers 5 holes.

Both heads at Station 14 blow-off and probe holes—one side for the intake manifold face, the other for the exhaust manifold face. Tapping is done at Station 15—12 holes on the LH side; five on the RH side.

Heads then enter a 27-station Greenlee transfer machine for a variety of operations, including: milling the ends; boring, drilling, chamfering, and tapping the ends; drilling, counterboring, chamfering, and tapping spark plug holes; milling spring seats; and tapping holes in the rocker arm face. This machine too has a holding fixture at each work station.

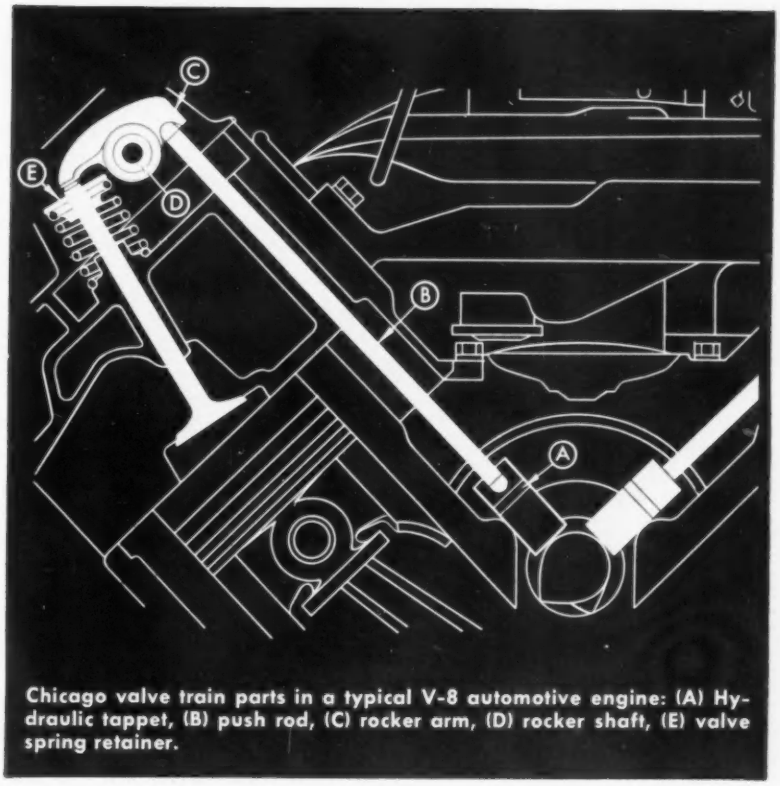
Both ends are milled at Station 5; while Stations 7 and 8 rough-bore a cup plug hole in each end. Stations 10 and 11 finish-bore and chamfer the cup plug holes. Five holes are drilled in each end at Station 13; the same holes being chamfered at Station 14. Blow-off and probing of five holes in done at Station 16. Station 17 taps five holes in each end. At station 19 the work is turned 90 deg., positioned at Station 20 with spark plug holes in horizontal position.

Four spark plug holes are drilled at Station 21; probed with one head at Station 22, counterbored at the other head. The same group of holes is combination drilled, chamfered and counterbored at Station 23. Exhaust valve spring seats are milled at Station 24 on one side; combination drilled, reamed, and chamfered at the other head. The four holes then are tapped at Station 25 and the work turned over to crankcase face down.

Cup plugs now are assembled in each end and the heads are air-tested in a 6-station Whittington machine to detect leakers.

Last major operation is the sequence through the 26-station W. F. & John Barnes transfer machine. It is tooled for drilling intake and exhaust valve holes; open throats; milling the valve clearance bore; drilling valve holes; installation of valve guides; forming intake seats; gun-drilling of guides; forming intake valve seats; finishing the insert counterbores for exhaust valves. It may be noted here that all of the combustion chamber cavity is cast in the head and

For all engines - - -



Chicago valve train parts in a typical V-8 automotive engine: (A) Hydraulic tappet, (B) push rod, (C) rocker arm, (D) rocker shaft, (E) valve spring retainer.

Passenger cars

Trucks

Tractors

Diesels

Aircraft

Everything you need in valve gear

from CHICAGO

Here at Chicago you'll find a single source for everything you need in valve gear. These specialized facilities are solving problems and saving money for leading engine manufacturers . . . and can do the same for you.

Design and Engineering—at Chicago you'll find valve gear engineering experience in depth . . . men who understand your problems and will work with your engineering staff in designing cam shafts and complete valve gear assemblies for any type of engine.

Manufacturing—Chicago is a leading manufacturer of valve train parts. Our complete line includes precision-made hydraulic and mechanical tappets; push rods in both lightweight tubular and solid styles; valve adjusting screws including new self-locking screws that cut assembly costs; valve spring retainers; rocker arms and rocker shafts.

Testing—we have complete laboratory and engine testing facilities.

For the full story of how we can serve you, write our Tappet Division.

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

Circle 168 on Inquiry Card for more data

only that area related to valve seating operations is machined. The remainder of the area is put through as cast.

The first sequence of operations in this transfer machine deals with exhaust and intake lines, including finishing of four exhaust valve throats; drilling part-way for exhaust valve guides; rough spotfacing for exhaust valve clearance; drilling through for exhaust valve guides. These steps carry through to Station 5. Similar operations are repeated for the intake valve line from Station 6 to Station 8. Probing of intake and exhaust valve holes is done with two heads at Station 9.

Chips are dumped at Station 10 and both intake and exhaust valve lines are treated in turn to the following operations: semi-finish-face and finish valve throat; gun drill for valve guides. In addition, there is a semi-finish counterbore for exhaust valve inserts.

Intake and exhaust valve guides are pressed in with two heads at Station 18. The three predetermined depths of valve guide installation are adjusted mechanically consistent with the batches of cylinder heads being processed. The press operation is served by a special Gear-O-Mation attachment which stores a bank of valve guides and feeds them, on demand, to a cylinder head. At Station 20 the exhaust valve seat counterbore is finished and the valve guide gun-bored to size. The work is indexed at the next station and at Station 23 they complete the gun-boring of intake valve guides, and finish-forming of intake valve seats.

The remaining operations are primarily individual steps, including installation of exhaust valve seat inserts; finish-milling of the gasket face; rough- and finish-grinding of exhaust valve seats; and Centri-Spray washing and inspection. ■

ON OUR WASHINGTON WIRE

Federal spending is creeping ahead again. Costlier national defense, plus popular clamor for more let-Washington-do-it programs, is to blame. Present trends suggest the next Federal budget will be from $2 billion to $4 billion over the $78 billion annual budget set for the current fiscal year.

Even an $80 billion budget (unprecedented in peacetime) would fall far short of all spending demands now pending before the Congress. Among these projects: More for farm subsidies, more roads, extra handouts for veterans, federal water projects, new explorations of outer space, additional Washington spending for education.

Federal Budget Director Maurice Stans warns bluntly that the nation will simply have to reconcile its desire for more government handouts against its ability to pay for them.

Payroll of the Federal Government has now reached the $1-billion-a-month level. It's an all-time peak. Even wartime payrolls didn't approach this level.

Total Federal employment, however, is holding steady at 2.3 million workers. Increases in pay, not added bodies, pushed up the cost to the $1-billion-mark, according to the Senate-House Committee on Reduction of Nonessential Federal Expenditures.

Under pressure from the Congress, the Pentagon is narrowing the power of the military services to start new procurement programs. Closer screening of new buying programs is urgently needed, says Chairman George Mahon, D., Tex., of the powerful House military appropriations subcommittee. Joint Chiefs of Staff are supposed to weed out half-conceived projects, but often do not look too closely at new spending proposals.

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SILICONE NEWS from Dow Corning

Easier Way to Make Prototypes

↑ STEP 1

STEP 2 →

Case History: Making Hub-cap Embossing Dies

SILASTIC RTV SILICONE RUBBER Molds Strip Fast and Easy

Silastic® RTV, the Dow Corning liquid silicone rubber that vulcanizes at room temperature, provides a new and better way to make prototype parts. This fluid rubber is easily poured into, over, or around complex shapes, and sets up in a short time. The result is a strikingly accurate mold, into which you can pour many casting materials such as plaster, waxes or plastics. Because Silastic RTV will withstand temperatures up to 500 F, many molten metal alloys can also be cast. Silastic RTV strips readily from most materials without loss of pattern detail. Here's how one automotive industry supplier — Cadillac Stamp Co. — uses Silastic RTV to make templates for hubcap embossing dies.

Step 1. A wood pattern was machined to the exact configuration of the hubcap design. The intricate design requires a material that releases easily without loss of detail. Silastic RTV has been poured on the pattern to make a "negative" mold.

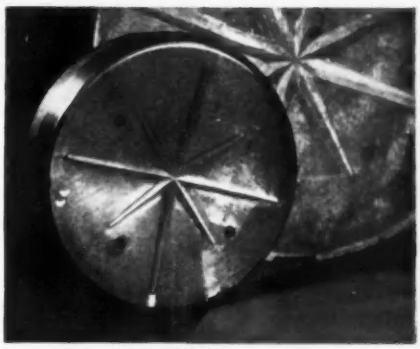
Step 2. The Silastic RTV mold is then used to cast a plastic. A "positive" image that faithfully reproduces the original pattern results. This image forms a template or prototype from which a pantograph-type engraving machine can sink dies.

Step 3. Now we return to the rubber mold, and this time more Silastic RTV has been poured into it. A rubber "positive" results. The two rubber molds release readily and two exactly matching parts result.

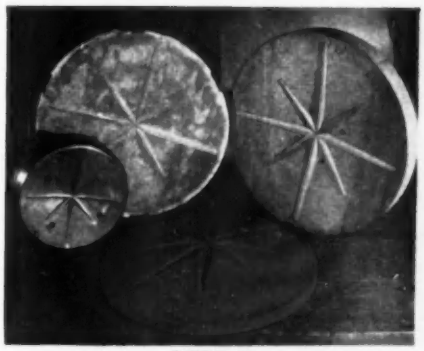
Step 4. From the rubber "positive", another plastic image is cast. Silastic RTV strips off easily . . . a crucial factor. The second plastic template is now ready for the engraving machine to sink dies. Size is reduced by one-half in the process. Note size of finished hubcap.

Step 5. Here are all the steps reassembled. Remember — both embossing dies were made from one wood original, thanks to Silastic RTV. Throughout the process there has been no loss of pattern detail . . . and exactly matched dies have been made.

STEP 3



STEP 4



STEP 5

Is there a way that this easy handling and faithful reproduction can help you? We'll be glad to assist in adapting Silastic RTV to your operations.

Free Sample. Write on your letterhead for data and sample of Silastic RTV. Address Dept. 0621

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

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DOW | New keys to automotive progress

The keys are Dow plastics and they're opening up a bright new world of opportunities in the design, engineering and production of today's finest automobiles. From automotive chemistry at Dow comes a steady stream of these versatile materials that not only expedite production, but make significant contributions to motoring comfort and pleasure. It will pay you to make note of Dow automotive products highlighted on these pages.

You may wish to check certain items in this advertisement and forward to those concerned in your company.

ROUTE TO:

_____

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PLASTICS SPEED PARTS PRODUCTION . . . CUT COSTS

Two famous Dow plastics cut costs and improve the quality of highly complicated molded parts for two of motordom's fine car manufacturers.

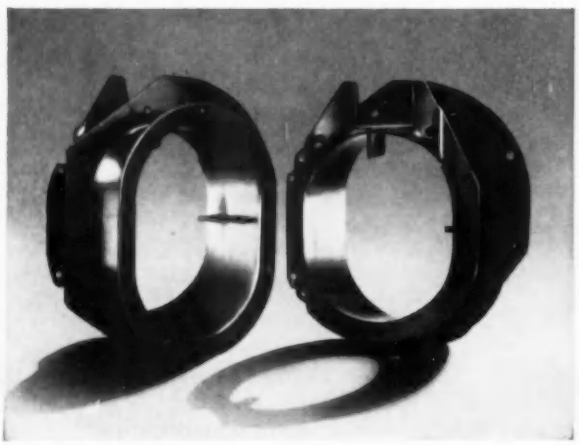
For many years, plastics have been contributing more and more to the interior and exterior appearance and serviceability of automobiles. Their easy moldability, their durability and limitless color range have given automotive engineers a new freedom of design, unavailable in conventional materials. From acid resistant battery caps to the smartest upholstery fabrics, plastics have proved the most versatile materials in the automotive world.

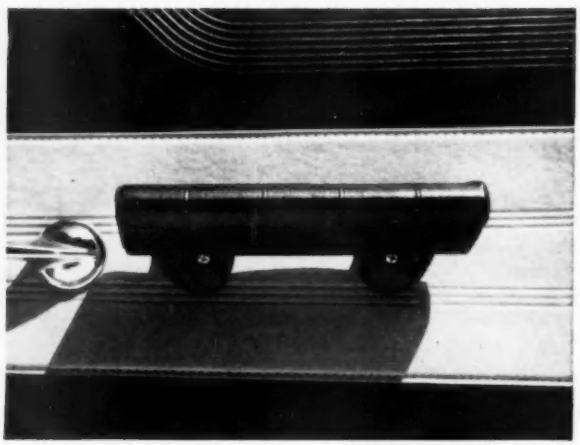
One news-making application for plastics is the fresh air valve body made of Styron®440 for one of America's finest '59 models. This injection-molded unit is lighter in weight and can be produced more efficiently than previously used materials.

Styron is well known for its fidelity to detail in the most complicated moldings. And Styron 440 provides the most effective heat resistance over a wide temperature range.

Ethocel®, another prominent member of the Dow family of thermoplastics, has made possible new styling and serviceability in the arm rest base of another leading automobile. Here, the manufacturer has made the most of the moldability . . . the outstanding strength and impact resistance . . . the wide color range . . . of the aristocrat of thermoplastic materials. And it can be vacuum metalized to add to its styling potential. Ethocel has provided a better part without increasing its cost.

The Dow family of thermoplastics offers the widest range of formulations in the industry . . . plus technical assistance in the application of these materials to automotive needs.





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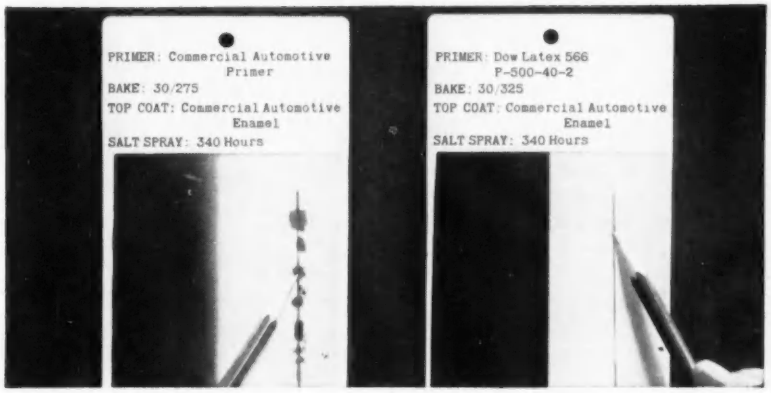
latex modified portland cement

Latex modified portland cement eliminates costly, time-consuming preparation of old floors. Dow Latex, as the binder, reinforces the physical properties of formulated cement mortar and bonds it tightly to concrete, wood or metal floors . . . makes it possible to localize repair areas . . . provides a surface that withstands constant traffic and heavy lift trucks.

Dow supplies latex to leading manufacturers of floor surfacing materials—ask for latex modified portland cement on your next repair job.



PRIME METAL TO PREVENT RUST

latex paints

A rust preventive dip coating of primer formulated with Dow Latex is licking the rust problem for some of America's finest cars. Not even salt spray can attack metal protected with a latex finish! These paints for metal not only guard the beauty of these cars, but offer spectacular benefits in your plant. Because water replaces flammable solvents, both fire hazard and costly solvent recovery systems may be eliminated. Safer working conditions and reduced insurance rates can result. Paints for metal formulated with Dow Latex bring a new era of safety into the paint shop.

★ ★ ★ ★

For further information on the many fine Dow plastics and coatings of special interest to the automotive industry, contact THE DOW CHEMICAL COMPANY, Midland, Mich., Plastics Sales Dept. 1705T9-15.

NEW AND NOTEWORTHY
from automotive chemistry at Dow

PREMIX PLASTIC MOLDING made with Dow Vinyltoluene makes a quality panel housing for an air conditioner . . . saves production time and money on housings of uniform strength throughout.

DOW LATEX 2582 takes the limits off high styling of automobile fabrics . . . backs fabrics with new color stability, resistance to metal dye staining and to fading and aging . . . makes light colors practical.

Dow Plastics
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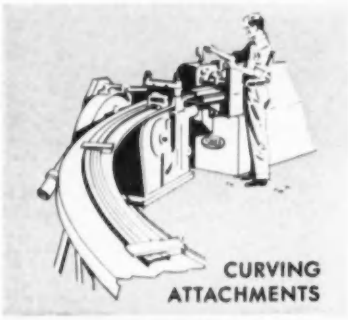

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COLD ROLL-FORMING
EQUIPMENT

for profitable mass production

High speed, YODER Cold Roll-Forming machines are the most economical method for mass producing structural or ornamental shapes. One machine with one operator can form up to 40,000 feet of shapes per day. Even on a part-time basis, a YODER Cold Roll-Forming machine can prove to be a profitable investment.

YODER flexibility works for you too, curving, coiling, ring forming, multiple roll-forming and embossing—on a wide variety of metals—can be incorporated into your production line. Practical, YODER-engineered design minimizes maintenance and downtime... assures uniformity, accuracy and reliability of your end product.

In addition to Roll-Forming machinery, YODER also makes a full line of Rotary Slitting equipment, Pipe and Tube mills. Send for the fully descriptive Cold Roll-Forming Book.

THE YODER COMPANY
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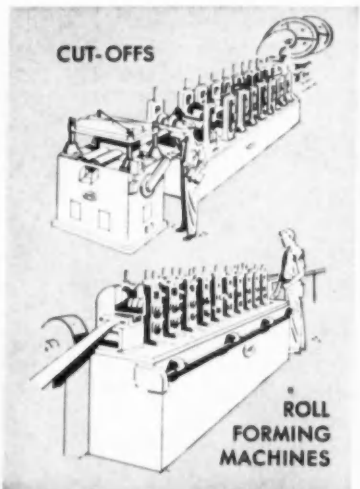

ENGINEERING YODER MANUFACTURING
COLD ROLL
FORMING
MACHINES

Circle 164 on Inquiry Card for more data

Chevrolet Trucks Have Torsion Bar Springing

(*Continued from page* 63)

angle; revised spring cambers and leaf stress levels; and shortening of some secondary leaves.

Rear springs of all two-ton and up models feature a marked change in design from previous years. two-stage variable rate leaf springs provide ride and control consistent with the new front suspension and still retain full load carrying capacity.

The new system provides a softer unloaded ride with a uniform increase in rate as the load increases.

Adopted for the 1960 tandems is a new 30,000 lb Eaton-Hendrickson suspension system. Three models are offered on 157, 175, and 193 in. wheelbases, with GVW of 36,000 lb. Features of the tandem drive design are full-floating axles and variable-rate springs. Drive to the rear axle is through an interaxle differential with a lockout for maximum traction under adverse conditions.

Chevrolet will offer four basic engines in its 1960 truck line—the 235 and 261 cu in. sixes and the 283 and 348 cu in. V-8's. The 322 cu in. and one heavy-duty version 283 cu in. V-8 are discontinued.

A new hydraulic clutch control system is standard on all but forward control models.

Twelve transmissions are available in the 1960 line. A two-speed Powerglide fully automatic transmission replaces Hydramatic as optional equipment on one-half and three-quarter ton conventional models. Hydramatic is retained as an option on forward-control models. Use of the improved Powermatic on larger units is continued and availability of five-speed manual transmissions is extended. ■

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...by WESTERN are better!

Because now, at no extra cost, the principle hazard found in ordinary seal rings has been removed by Western's *No Splice* method of one-piece construction. In addition, dimensional requirements are maintained at less cost and service is vastly improved.

Don't use a spliced ring for technical seal applications, but profit from our more than 50 years experience—specify *Cord Rings* by Western.

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What's behind a better ring? For one thing, a superior metal like electric-furnace PHOSALLOY —another McQuay-Norris exclusive that gives rings unusual toughness and tension-retaining qualities!...Let one of our sales engineers give you the whole story. Let him show you how we work with original equipment designers to get the results they must have. Call us next time you have a piston ring problem.

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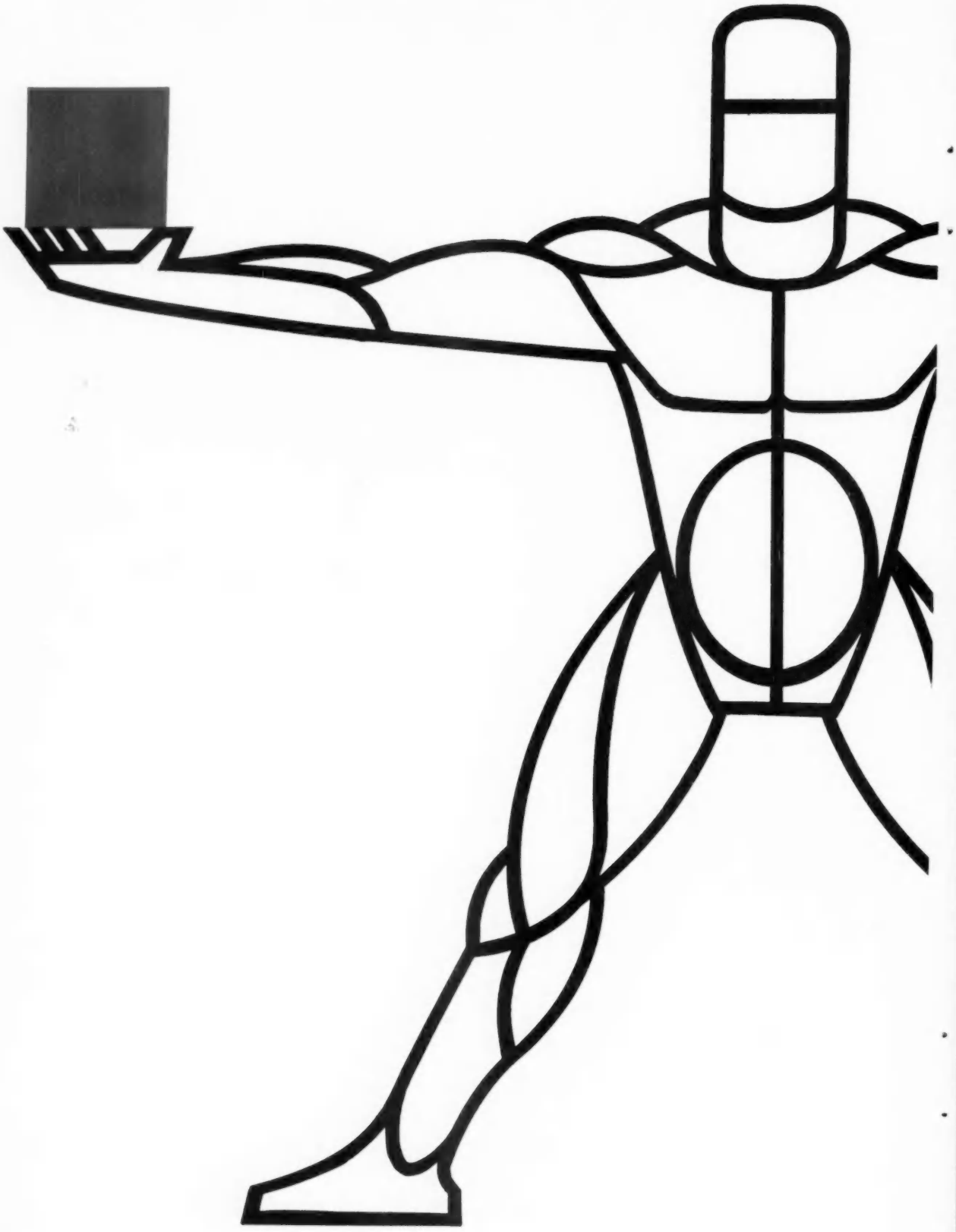
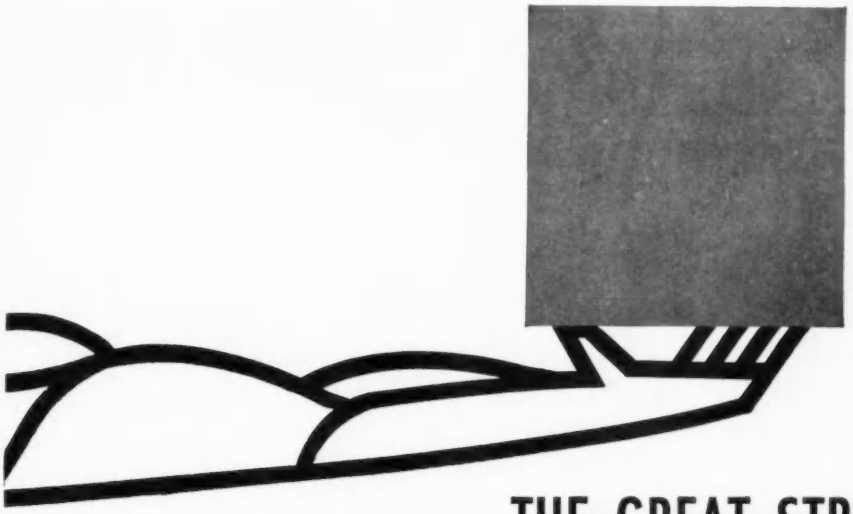
MANUFACTURING CO., ST. LOUIS • TORONTO

Largest Producer of small rings in the automotive industry.





THE GREAT STRENGTH OF N-A-XTRA

LETS YOU ELIMINATE COSTLY DEAD WEIGHT FROM YOUR PRODUCTS

N-A-XTRA is the best low-alloy, extra high-strength steel you can buy. Heat-treated, fully quenched and tempered, it's now available in minimum yield strength levels of 80,000—110,000 psi. This is nearly three times the strength of ordinary carbon steel.

The great strength of N-A-XTRA gives engineers and designers a unique opportunity to eliminate bulky, useless dead weight from finished products. Production men will delight in its superior formability and superb weldability. Send today for our illustrated brochure on N-A-XTRA HIGH-STRENGTH steel. Great Lakes Steel Corporation, Detroit 29, Michigan, Dept. J-8.

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A DIVISION OF NATIONAL STEEL CORPORATION

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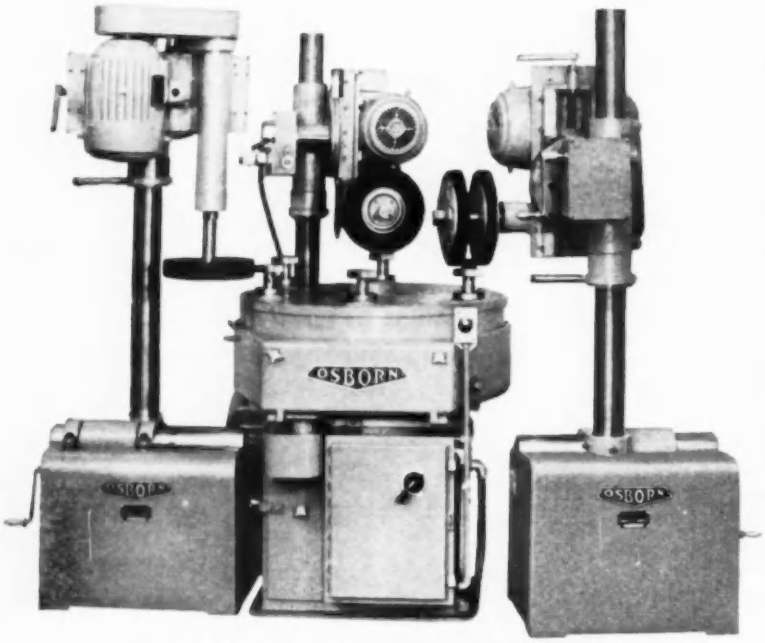
Cut your metal finishing costs with this...

NEW OSBORN BRUSHAMATIC® ROTARY INDEX MACHINE



NEW OSBORN BRUSHAMATIC® ROTARY INDEX MACHINE
Units can range from manual to fully automatic operation.

Unique "building block" design means unlimited production flexibility

NEWEST ADDITION to Osborn's broad line of metal finishing machines are these Brushamatic® Rotary Index units. Capability: significant increase of your production capacity.

Most important feature—production men can economically "build" *custom* Brushamatic Machines from *basic "building block"* components . . . brushing heads, index tables and electric controls. Other advanced design and construction features make these new Brushamatic units worth your immediate investigation.

Your Osborn field specialist has latest application data on a wide range of cost-saving finishing methods. And an **O**sborn **B**rushing **A**nalysis—made in your plant—is the first step to pinpoint savings on *your* operations. Write for details. *The Osborn Manufacturing Company, Dept. E-83, Cleveland 14, Ohio.*

THE OSBORN MANUFACTURING COMPANY

METAL FINISHING MACHINES...AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES
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OSBORN®

SHORTIES

The number of trucks on U. S. farms has increased from 2.2 million to 3 million in eight years.

●

One-third of all special taxes on U. S. highway users—$2.5 billion—are paid by motor truck operators.

●

One out of every five trucks manufactured in the U. S. is exported, with Latin America as the biggest market.

●

A new system, recently developed by an aerospace firm, to detect foreign objects in jet fuel will pick up particles as small as one micron (0.00003937 in.) up to 25 microns.

●

A machine capable of producing a jet of energy three times hotter than the surface of the sun is being used by an aircraft company in its materials research program.

●

Since 1950 the number of house trailers in the U. S. has risen from an estimated 500,000 to about 1.2 million last year.

●

Today's house trailers average 50 ft in length, 10 ft in width, have at least three rooms and bath, and cost between $3500 and $13,000.

●

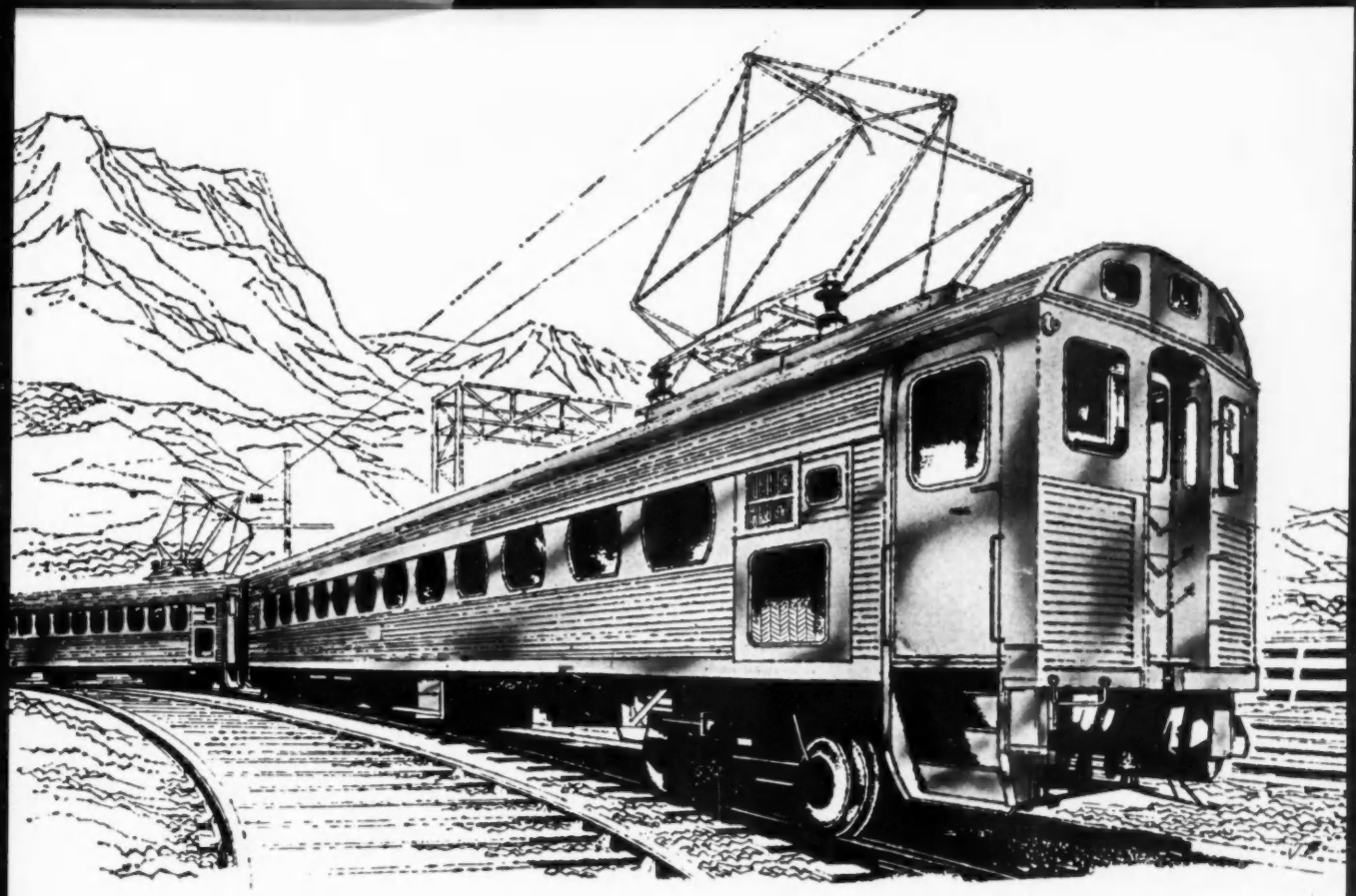
Of the three million people who live in trailer parks, two-thirds are skilled workers, professionals, or are retired.

●

A new bomber and fighter now under development will require about 20,000 suppliers.

●

A supersonic fighter-bomber required about 2 million engineering hours from design to first flight compared with 87,323 for a World War II model.



Light as a 128-Passenger Feather

Because it makes practical use of the remarkable strength-weight ratio of the austenitic stainless steels, this all-stainless steel railroad passenger car weighs **25 tons less than other so-called modern equipment.**

It is an important contribution to railroad operating economy and efficiency because its stainless steel structure guarantees millions of miles of service between overhauls —its gleaming exterior requires no paint.

Designed and built by The Budd Company, it is considered one of the greatest engineering achievements of the century—made possible **only** by that brawny beauty stainless steel.

In your product engineering when weight is a problem and strength a necessity the answer can be found in stainless steel's unique combination of strength, durability and beauty.

J&L leads the industry in melt shop standards for stainless steel—the point where quality starts, **and engineering achievement begins.**

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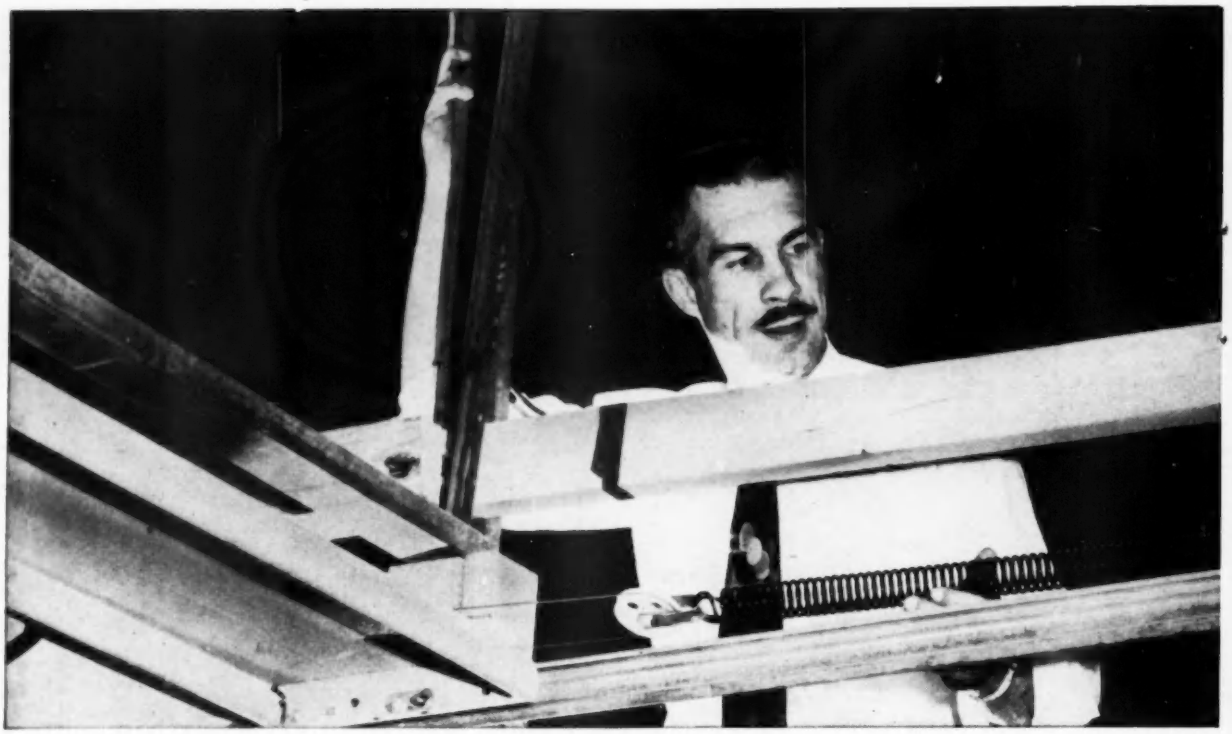
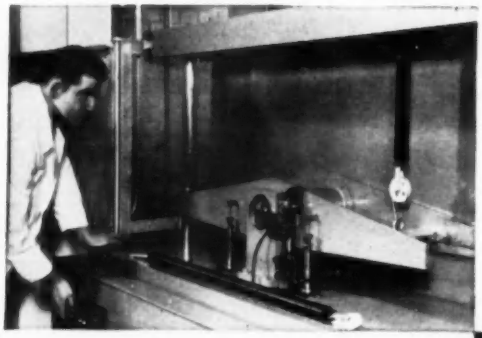


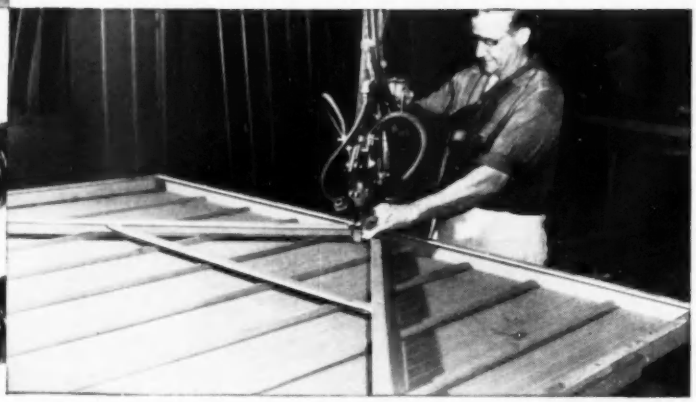


At Steel Door . . .

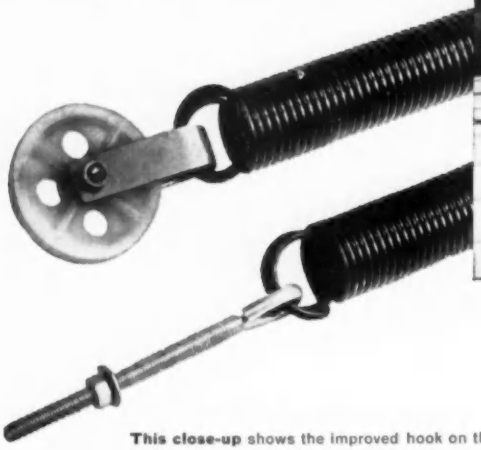
USS American Springs

thanks to AS&W

In the American Steel & Wire Fatigue Laboratory, a technician runs tests on a USS American Spring, designed for Steel Door use. On the basis of this test a change in hook design was recommended to give longer spring life.



A Steel Door workman assembles a Berry One-Piece Door. This company uses steel exclusively for all doors because of its many consumer advantages. Steel is stable, won't warp or swell. Steel doors need less maintenance and preparation, and steel doors are easy to operate.



This close-up shows the improved hook on the extension springs supplied by American Steel & Wire for the Steel Door overhead garage doors.

stretched 31,000 times and still going strong...

Spring Engineering Research Service

The Steel Door Corporation, Birmingham, Michigan, is the world's largest manufacturer of residential garage doors. For the production of these doors they use about 150,000 USS American Springs every year. Steel Door asked American Steel & Wire for a statistical evaluation of the fatigue life of the extension hook-type springs they use. The AS&W Spring Engineering Research Service tested these springs in the Fatigue Laboratory and recommended a change in hook design.

So successful was this design change that the life of the springs has been materially increased. At the Steel Door plant a cycle test was set up using USS American Springs on an overhead door. At the present time these springs have completed over 31,000 cycles without showing any sign of failure. This is the equivalent of 25 years of normal usage.

Mr. Ralph Qualman, Advertising Director and Service Manager, says: "It is extremely important that the springs—especially those used on sectional doors where the strain is greatest—have proper tension and a long life. American Steel & Wire supplies Steel Door with springs that meet their engineering specification and life expectancy."

If you have a spring problem or would like advice on the use of springs in your product, get in touch with our general offices in Cleveland, or any American Steel & Wire Sales Office. You can benefit from the knowledge of AS&W's Spring Engineering Research Service. The Service has been engaged in laboratory experiments of static and dynamic testing for 20 years and has accumulated invaluable data on stress and fatigue life of steel springs, while endeavoring to improve efficiency in the use of steel—from steel chemistry through product application—to more economically cope with today's rigorous demands. This accumulated knowledge of the AS&W Spring Engineering Research Service is at your disposal. *American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.* *USS and American are trademarks*

American Steel & Wire Division of USS **United States Steel**

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Automatic Transmission Testing

By H. H. Kehrl, M. R. Marsh and R. A. Gallant
Chevrolet Motor Div.,
General Motors Corp.

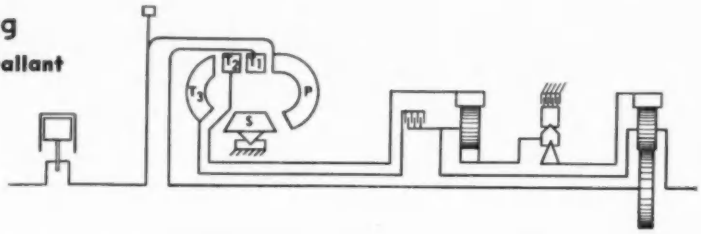


Fig. 1—Turboglide neutral to drive shaft

IN the Turboglide neutral to drive shift, the T_1 sprag clutch must accept the sudden change from a high speed overrunning condition to a high torque lockup. (Fig. 1.) The T_2 sprag has a similar assignment when the change is made from road load to full throttle acceleration in the mid-speed range.

Test Machinery

The test machinery was specifically developed to duplicate either of these conditions by providing: high speed rotation of the inner race; predetermined input torque to the outer race; the means of grounding the inner race; and a measure of the reaction torque.

Testing is done on a single clutch, either the T_2 outer or T_1 inner sprag assembly. In either case the test piece is measured for strut angles, race diameters, and drag torque before entering the test machine.

Mechanics

The cycle begins with the outer race being driven through a reduction unit at 7 rpm. (Fig. 2.) The inner race is driven in the same overrun direction. When it reaches 3000 rpm, the driving motor is de-energized. A timer then engages a clutch (actually a Powerglide clutch pack) between the inner race and a torque arm attached to a hydraulic cylinder. The rapid torque build-up on the sprags due to the abrupt lockup is limited to a specified value by a relief valve in the cylinder. Movement of the torque arm then trips a micro-switch to disengage the clutch, and the cycle is automatically repeated.

Belt Failure

An interesting problem in the design of this fixture was the repeated failure of the belt that brings the inner race up to speed. Failure was caused by the decelerating torque of the Powerglide

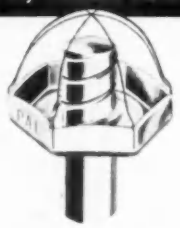
(*Turn to page* 140, *please*)

Now - a decorative
ACORN TYPE
added to the line of
PALNUT®
Self-threading Nuts

MAKE THEIR OWN THREADS
on unthreaded studs, rods, pins, etc. of any malleable materials

- Protects against scratching
- Provides vibration-proof assemblies
- Pleasing appearance

Where exposed studs can not be tolerated (for example, in trunk areas) the new Acorn Type Self-threading Nuts not only eliminate the cost of threading, but the smooth contour automatically covers up studs which may otherwise damage articles or scratch hands. Sizes for $\frac{1}{4}$" and $\frac{3}{16}$" dia. studs and rod. Get details and free samples.



Big Savings in Parts and Assembly Costs

Low-cost PALNUT Self-threading Nuts eliminate threading of parts because they form their own clean, deep threads while tightening on unthreaded studs, rods, wire and plastics. They assemble fast with standard power tools, even on off-angle studs and in confined spaces. Spring-tempered steel prevailing torque holds tight, whether seated or unseated. May be used and re-used on the same stud. Widely used on ever-increasing automotive applications.

• Write for Free Samples and Bulletin 585

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Other Types Available:
WASHER TYPES

Type ST, large base

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Washer with Sealer

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Type RST

PALNUT® LOCK NUTS FASTENERS PAL

MIDLAND

TREADLE VALVES

NEW, IMPROVED MODEL SPEEDS BRAKING TIME

Here's a Treadle Type Foot Control Valve you can't beat for application and release time. Redesigned from beginning to end, it's compact, light, easily adapted to varying installation requirements . . . Trim, modern styling adds a lot to its appearance—and the tread is rubber-capped for extra safety's sake . . . We'll be glad to give you a demonstration, or furnish a sample for your examination.

MIDLAND-ROSS CORPORATION

OWOSSO DIVISION,
OWOSSO, MICHIGAN

AIR MIDLAND BRAKES

ONE OF THE 400 LARGEST AMERICAN CORPORATIONS

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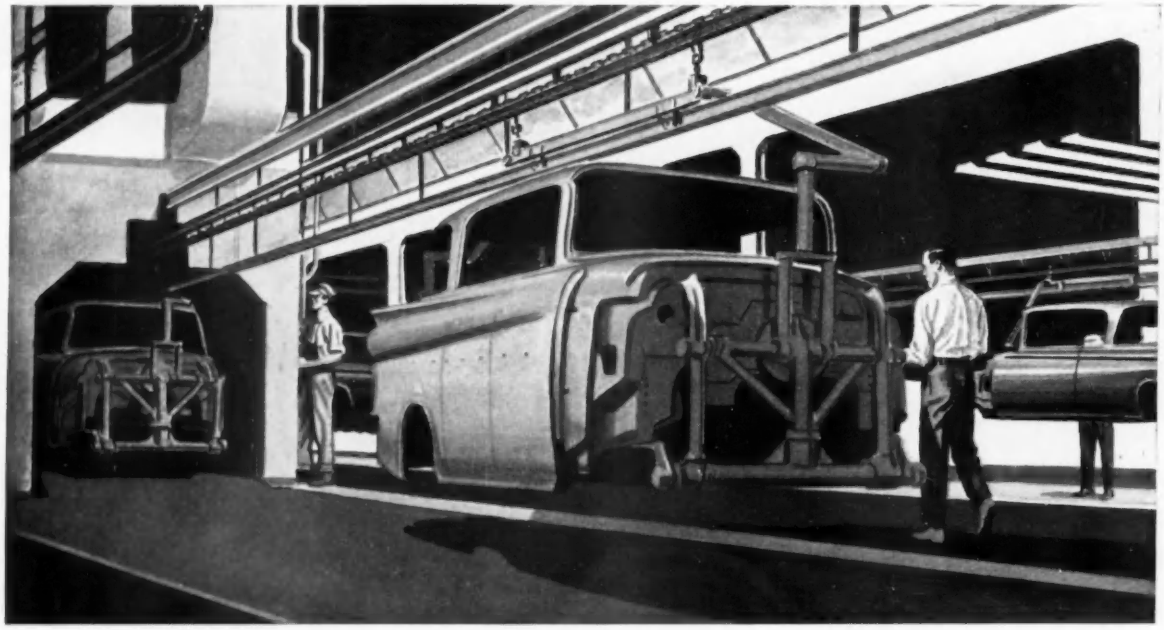


In the automotive industry alone, there are 30 Cold Bonderite installations.

How Cold Bonderite System cuts costs

Some actual user-experiences of savings in heat requirements, maintenance, water and electricity, and equipment after installing Cold Bonderite System.

Less than two years ago, the first public announcement of Parker's Cold Bonderite System was made.

Now, well over a hundred plants are using this revolutionary, money-saving system of phosphate-treating at low temperatures.

Some are among the country's largest plants, others are quite modest in size and production. Products treated range the list from automobile bodies to small appliance components.

From these users we have compiled a long list of documented savings records. In many cases, cost reductions have been greater than we had hoped to achieve.

The temperature tells the story! Cold Bonderite System solutions operate 60° to 75° cooler.

Heat Saved

The greatest percentage savings in heat requirements (90%) has been reported by an automotive plant. Before installing Cold Bonderite System, the finishing line used 50,000 pounds of steam an hour. Cold Bonderite in the line uses only 5,000 pounds per hour.

In another auto plant, heat savings are figured at 74% on a body line. A small parts finishing line in the same plant shows the same percentage reduction in heat requirements.

A manufacturer of metal cabinets reduced gas consumption for heating his phosphating line from 33,000 to 14,000 cu. ft. per day—a 56% reduction—by installing the Cold Bonderite System.

A famous maker of household equipment changed from conventional phos-

phating to Cold Bonderite System and saw his steam use plummet 66%.

Another manufacturer, an Eastern small appliance maker, reports that on gas expense alone he has cut his phosphating costs 45%.

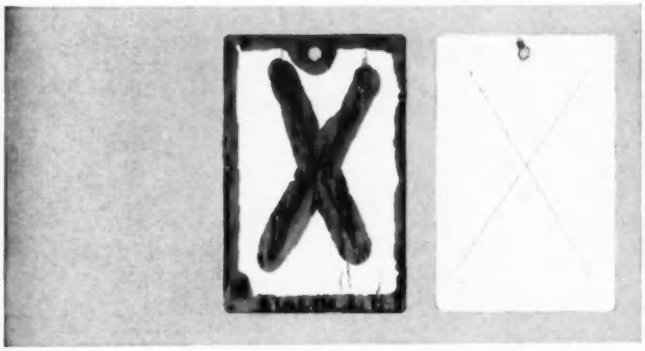
Other Savings Pile Up

The magnitude of other savings, beyond heat consumption, has been surprising to users and very good news to their cost accounting departments.

Electricity, for instance. At the greatly reduced temperatures of the solutions, there is no need to operate exhaust fans. In one installation, the change to Cold Bonderite eliminated the need for replacing a $15,000 exhaust system.

Water use is reduced about 25% because there is less evaporation.

Maintenance costs nosedive with Cold Bonderite System in the finishing line. Lower temperatures in the heating coils mean less frequent—or no necessity for—cleaning the coils. When there is service to be performed, the maintenance crew can move right in without waiting for the installation to cool off.



Comparative 48-hour salt spray test proves performance. Left, untreated panel; right, panel Cold Bonderite-treated before painting.

One user figures that he has eliminated 364 manhours of maintenance time yearly with his Cold Bonderite System.

The same manufacturer has discovered, too, that the reduced temperatures have allowed him to eliminate a number of steam traps and steam coils costing over $8,000.

Coating Quality Is High

While Cold Bonderite System is saving money on the phosphating line in these many ways, there has been absolutely no diminution of quality in the coatings or their performance.

The Bonderite coating produced by low-temperature Cold Bonderite System matches the high standards set by Bonderite for thirty years. In salt spray, humidity and outdoor exposure tests, as well as in actual service on automobiles, appliances, furniture and many other products, performance has been proven.

Results are uniform hour after hour and day after day. Control and operation of the system is simple and practically foolproof.

Chemical Costs Held Low

All the savings attained by the use of Cold Bonderite System are *real* savings. They show up on the P & L statement because *chemical costs for this revolutionary development are not increased.* The special Bonderites and Parco Cleaners are strictly comparable to conventional hot treatments in the cost of treatment per square foot.

Only Parker Has Cold System

There is, actually, no other system like it. Cold Bonderite System was developed by Parker research, tested and perfected by Parker chemists. It has been proven over and over again as the way to get superior phosphate coatings on steel with spectacular savings.

The Parker representative in your territory is ready to advise and work with you to change your phosphating installation over to Cold Bonderite System. Call him in or write direct to Parker, Detroit.

**Bonderite, Bonderlube, Parco, Parco Lubrite – Reg. U.S. Pat. Off.*

PARKER RUST PROOF COMPANY

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BONDERITE corrosion resistant paint base | BONDERITE and BONDERLUBE aids in cold forming of metals | PARCO COMPOUND rust resistant | PARCO LUBRITE—wear resistant for friction surfaces | TROPICAL—heavy duty maintenance paints since 1883

Automatic Transmission Testing

(*Continued from page* 136)

clutch, and was eliminated by installing a small slip clutch between the pulley and the race to limit belt tension.

Wear characteristics are also evaluated by a simple high speed overrun test.

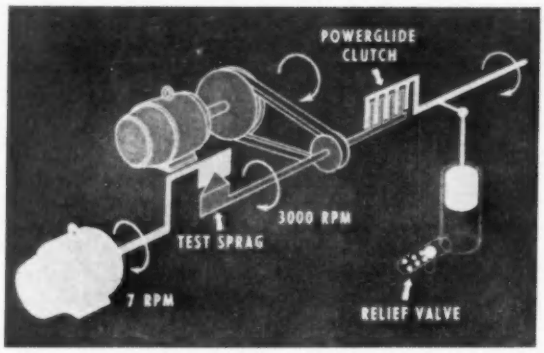

Fig. 2 — Overrunning clutch dynamic test schematic

The foregoing is an abstract of a paper presented by the authors at the SAE National Passenger Car and Production Meeting, held in Detroit last March. ■

Eagle Contractors

Bendix Aviation Corp. has named four companies to assist in development of the Eagle missile system for the Navy. Bendix Systems Div. of Ann Arbor holds the prime development contract, and two other Bendix divisions will work on the project.

Grumman Aircraft Engineering Corp. of Bethpage, N. Y., is major subcontractor and will be responsible for airframe and propulsion, as well as launching and some ground support equipment, Sanders Associates of Nashua, N. H., will develop the "seeker" used for homing.

Litton Industries of Beverly Hills, Calif., has been named to develop a tactical computer to maintain maximum effectiveness. And the Air Arm Div. of Westinghouse Corp. will supply an airborne intercept radar for detecting and tracking targets.

Bendix Research Laboratories of Detroit will develop electronic guidance equipment and Bendix Pacific Division of North Hollywood, Calif., will design and produce subsystems and assemble and test the Eagle.

Eagle is planned as a long-range air-to-air missile.

New COOLTEX gives smoother finishes

Everybody—from machinist to customer—is crazy about the new, smoother finish that Cooltex makes possible. Your local Texaco Lubrication Engineer can show you why—and tell you about the other advantages you get when you use this new chemical coolant. Call him today! Texaco Inc., 135 East 42nd Street, New York 17, N.Y.

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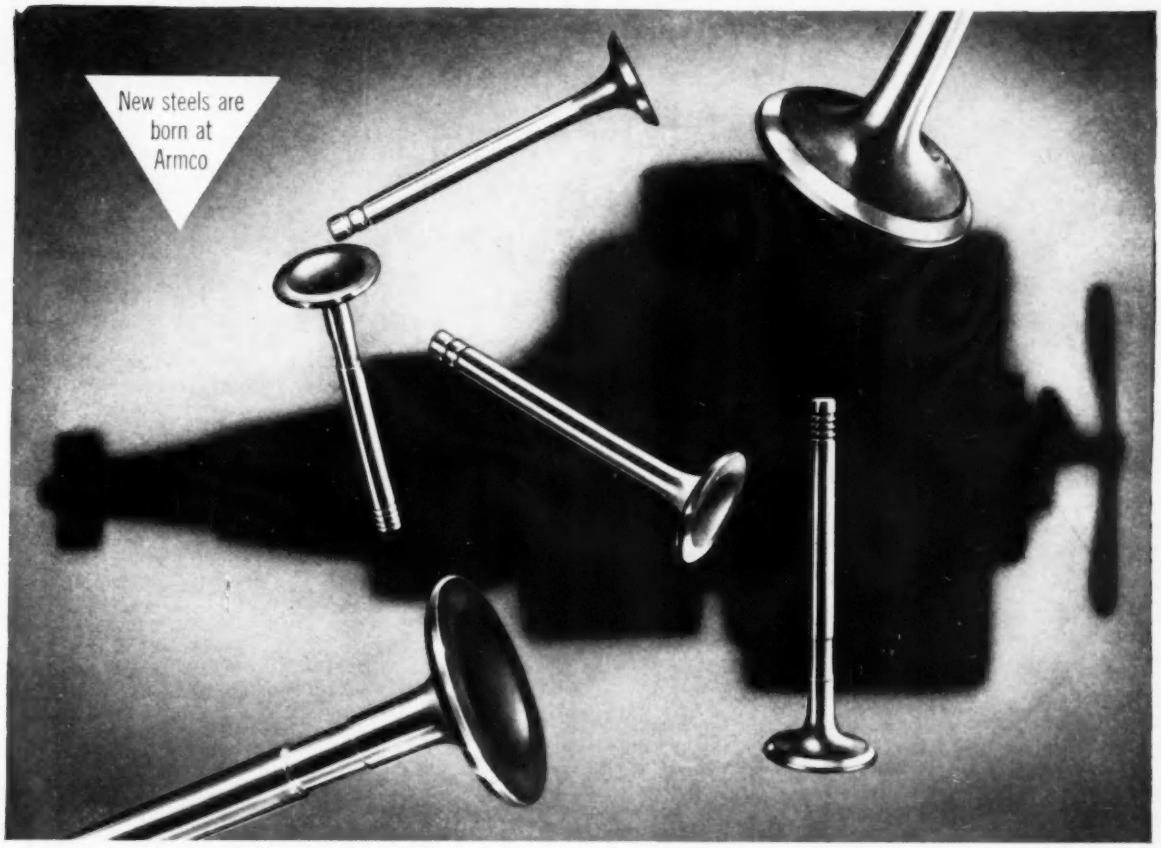

5 reasons why Armco 21-4 N* Stainless doubles life of one-piece valves

Field tests show that valves made of special Armco 21-4 N Stainless Steel average twice the life of one-piece valves made from other alloys. Here are 5 reasons why:

1. **Superior resistance to corrosion by lead oxide at elevated temperatures.**
2. **Great wear resistance at high temperatures because of outstanding "hot hardness."**
3. **Much greater high temperature strength.**
4. **Excellent stress-elongation properties at elevated temperatures.**
5. **Superior low temperature strength and hardness.**

Widely used

Because of their exceptional combination of properties, long-lasting valves of Armco 21-4 N give durable service in many types of engines—from the most powerful high compression truck and industrial engines to those in passenger cars.

Designated MS 201 by Thompson Products Valve Division (exclusive licensee), EMS 10 by Eaton Manufacturing Company (sublicensee), and MS 10-64 by Aluminum Industries (sublicensee).

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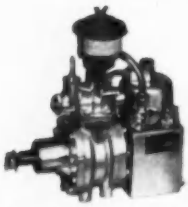
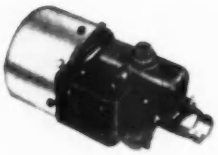


ROTARY AIR COMPRESSORS have a low temperature air delivery. This prevents carbon formation—reduces fire hazard—lets you use flexible connection in discharge line. Rotary operation provides thousands of overlapping air compression impulses per minute for smoother, quieter operation—increased belt and coupler life.

BRAKE APPLICATION VALVES. Hand valve is designed with extra long handle for convenient operation. Gives driver independent control of trailer brakes for smooth stops through entire range of deceleration. Foot application valve meters air smoothly through the range from slow to emergency deceleration—has extra high flow capacity—is light in weight and simple to service.

LOW PRESSURE INDICATOR—buzzer or lamp—warns the driver if air pressure falls below the safe driving range. Warning circuit is controlled by a pneumatic switch which is connected to the pressure side of the air brake system. Unit automatically closes the circuit if pressure drops below a predetermined value.

BRAKE CHAMBERS have fully oil-resistant diaphragms of nylon and neoprene to provide much better wear characteristics—less deterioration. All metal parts are of corrosion-resistant material, or are plated to prevent corrosion. Diaphragms are interchangeable—will fit in other makes of brake chambers.



POWER CLUSTER converts 100 p.s.i. of air pressure into approximately 1500 p.s.i. of unvarying hydraulic pressure. Gives much more uniform metering control than "booster" type hydraulic units. Provides power actuation through the entire range of braking and, in connection with our application valve, gives "low pedal" hydraulic brake operation.

MOISTURE EJECTION VALVE prevents moisture accumulation in the air tank. It is fully automatic, operating in the 15-25 p.s.i. pressure range. Normal brake applications operate the valve, keeping reservoir clean and moisture-free. Expulsions occur without a notable drop in gauge pressure.

TRACTOR PROTECTION and EMERGENCY BRAKE VALVES for combination vehicles—provide manual and fully automatic protection. In emergency they can be triggered by pulling the valve knob—however, the fully automatic units will activate without driver attention in any emergency due to trailer break-away or air loss failure.

RELAY QUICK-RELEASE VALVE controls the brakes on specific axles, acting in unison with the driver-controlled application valves. Automatically meters pressure directly from a reservoir tank, speeding normal braking and release. Low differential between input and output pressures provides better balanced braking actuation.

ALCOHOL INJECTOR keeps air lines and air reservoir free of ice. Connects to the discharge side of the compressor—does not contaminate the oil. Is of all-metal construction—no glass to break. Has extra large capacity—requires less frequent refilling.

WK59-7

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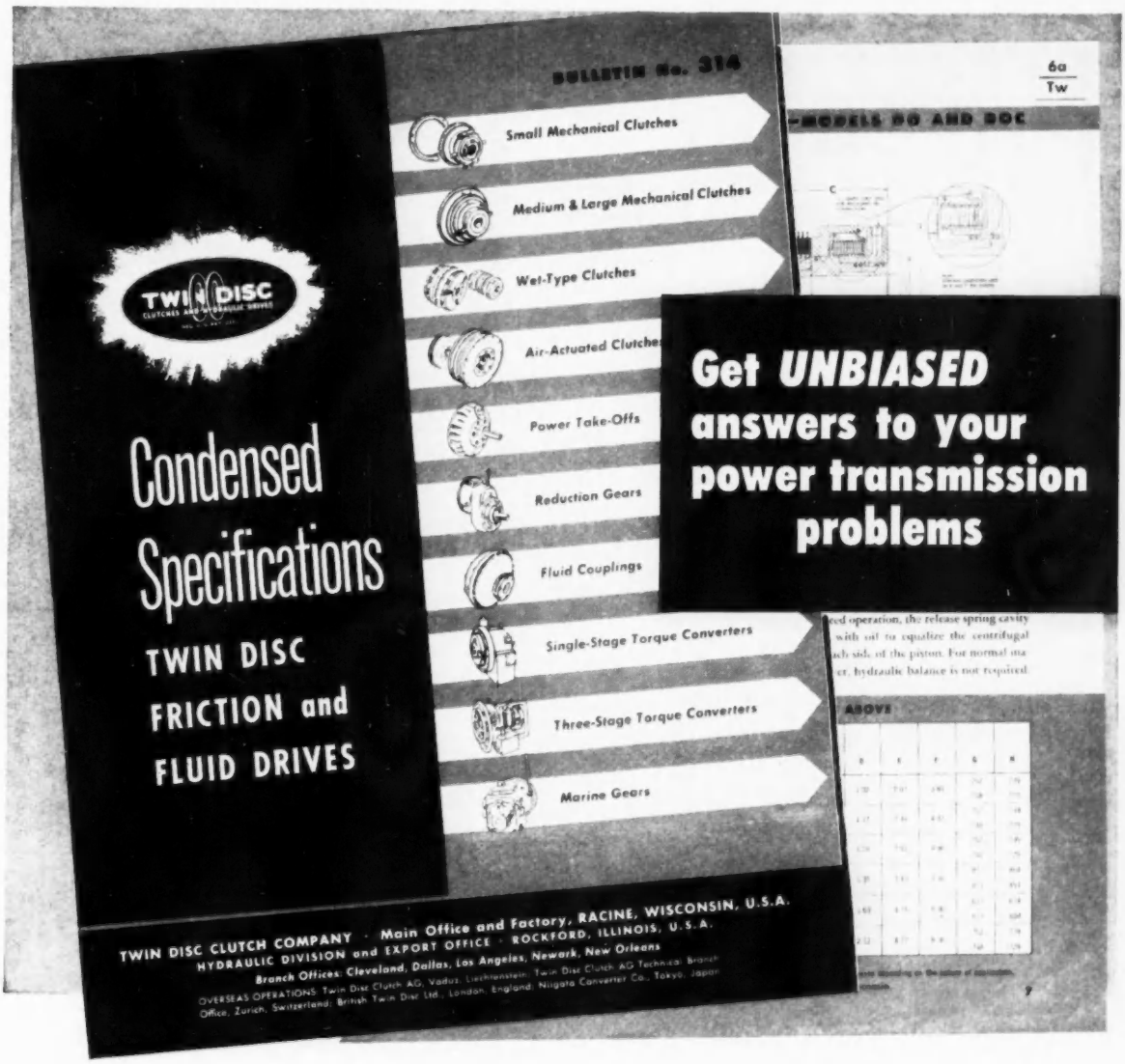
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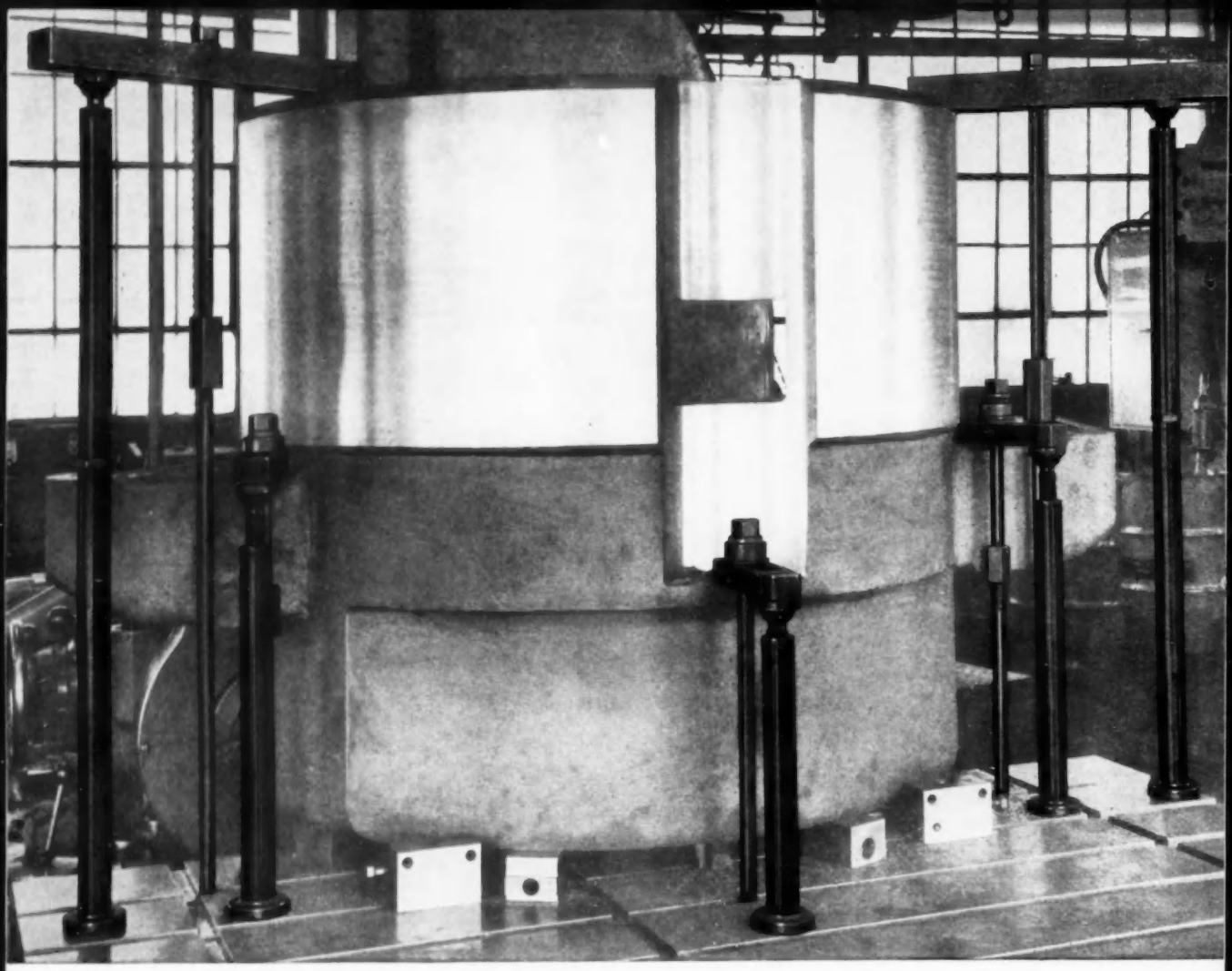

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USS National Seamless Tubing helps cut processing costs because it eliminates drilling operations. It enables you to replace drills with simple, less expensive boring tools. And, it reduces tool wear and tool changes.

USS National Seamless Tubing gives you a superior cross section for a part that is designed to withstand equal loading in any direction. It resists bending stresses. It absorbs and localizes shock. And in torsion, it provides a better material distribution, and for a given weight, can withstand more load than other sections.

There's a National Tube Distributor located near you. He's expertly trained in solving all types of tubing problems. So, if you'd like to learn how USS National Seamless Steel Mechanical Tubing can be applied to your designs, see him . . . soon!

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New! Polyken #292 glass fabric tape with silicone adhesive for use in high-temperature applications such as jet aircraft.

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That means you can now get a Polyken tape for almost any electrical use you can think of. No more need to search among several manufacturers.

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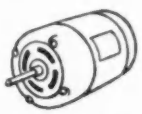
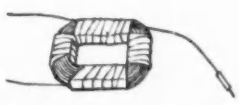
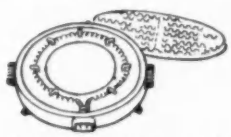


New! Polyken #158 cotton-backed electrical thermo-setting tape. Used in electric motor construction, etc.



New! Polyken #154 acetate cloth-backed thermo-setting tape, used for small gauge coil winding, etc.



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FIRST AND ONLY COMPLETELY FAIL-SAFE FLAME SAFEGUARD

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In 1951, a Honeywell advancement provided a "self-checking" operation at the time of burner startup . . . and spurred the search for full-time protection, because flame-safeguard components can and do fail "unsafely."

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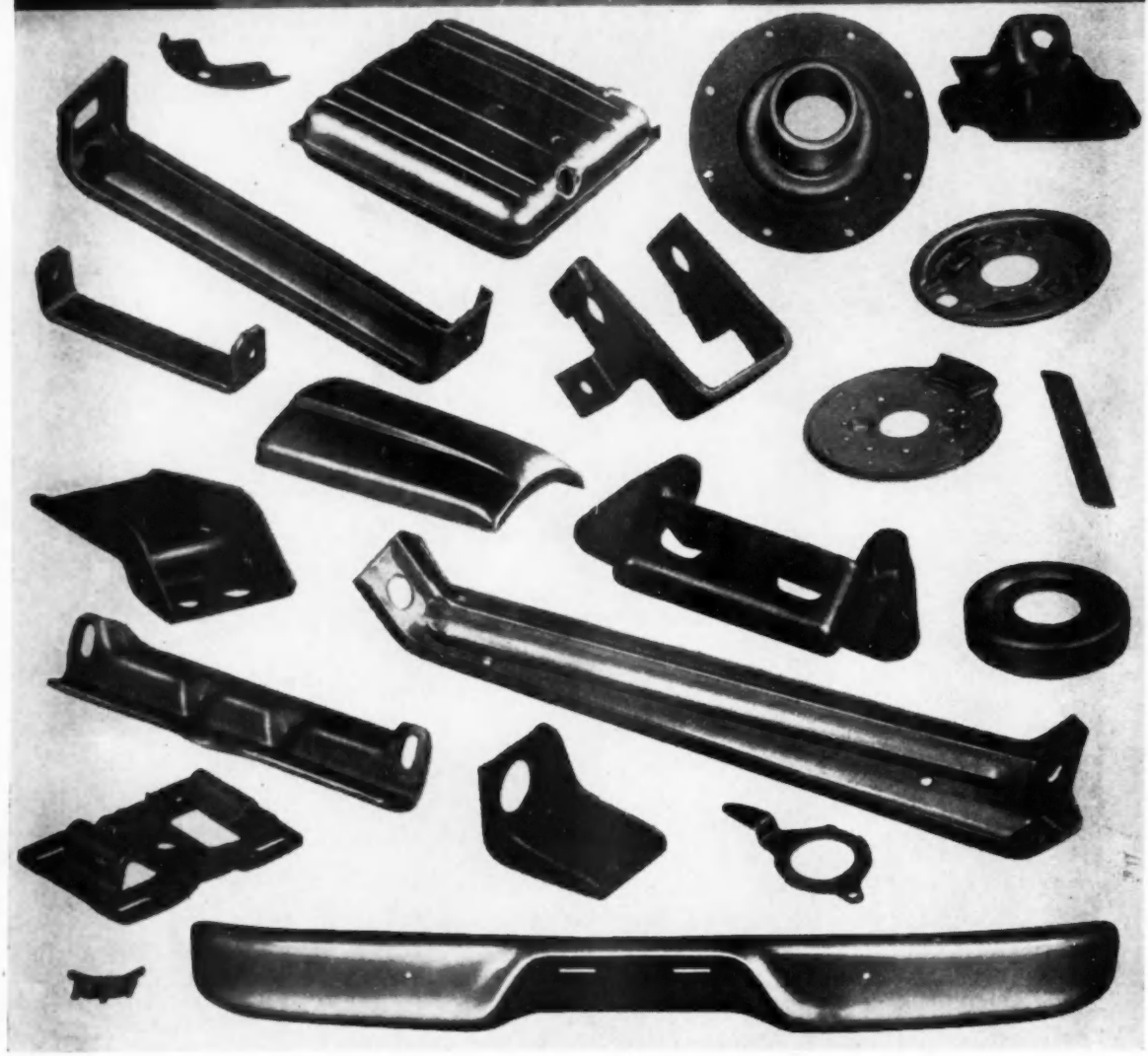

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IT'S WHEELING STEEL!

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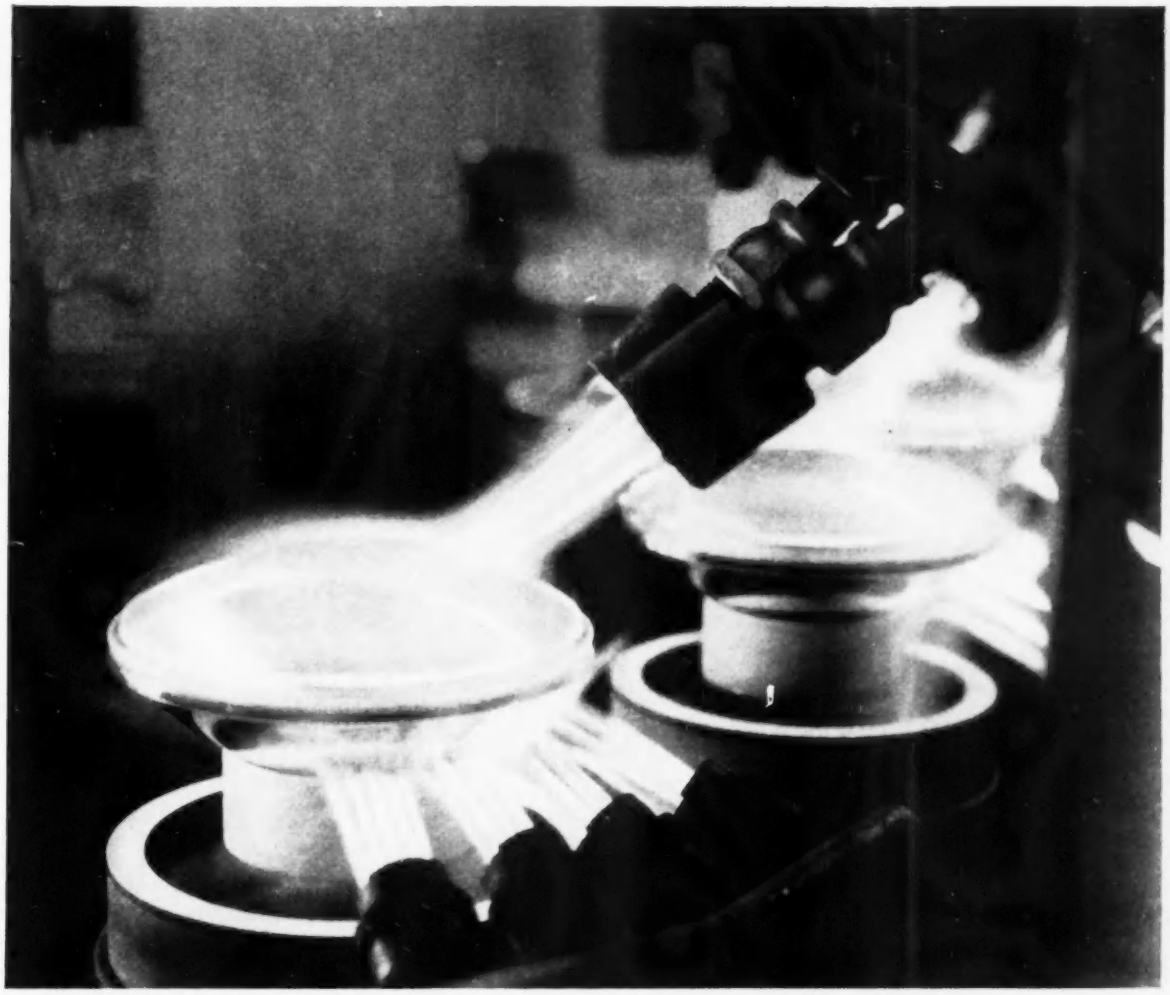
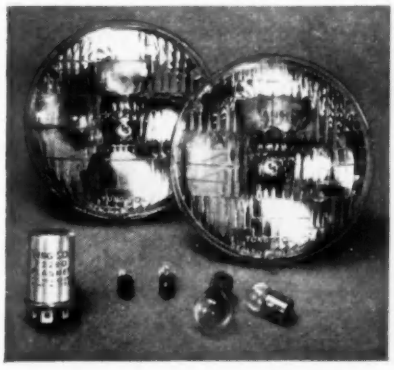


When we play with fire we know what we're doing



This is one of the uses of fire that Tung-Sol knows best—the sealing operation that joins the lens of a sealed beam headlamp to the reflector. It is one of the most critical of all operations in the manufacture of automobile headlamps. Intense jets of propane flame must be precisely controlled to bring the glass to a plastic stage at the flanges without disturbing the configuration of either part. Tung-Sol's ability to use fire constructively is just one of the many skills acquired in half-a-century of lamp-making.

In addition to pioneering the development of automotive lamps, Tung-Sol designed and developed the universally used Tung-Sol signal flasher. Tung-Sol circuit breakers protect the electrical equipment circuits in today's automobiles.

The Tung-Sol lamp line includes a wide selection of types developed for instrument panels and similar low voltage equipment applications. Consult Tung-Sol about your lamp requirements. Tung-Sol Electric Inc., Newark 4, New Jersey. TW:NK193.

TUNG-SOL®

Sealed Beam and Miniature Lamps—Flashers—Circuit Breakers

NADELLA

The NEEDLE THRUST BEARING WITH INTEGRAL RACEWAY

- NO THICKER THAN A WASHER
- LARGE LOAD CAPACITY
- CUTS COSTS
- RUGGED CONSTRUCTION

ALSO...
SPECIAL DESIGN
FOR HIGH-PRECISION APPLICATIONS

(. 1102 inch)
2.8

Metric sizes - D_i and D_e shown in mm and inches

AX	15 28	17 30	20 35	25 42	30 47	35 53	40 60
D_i	15 / .5906	17 / .6693	20 / .7874	25 / .9843	30 / 1.1811	35 / 1.3780	40 / 1.5748
D_e	28 / 1.1024	30 / 1.1811	35 / 1.3780	42 / 1.6535	47 / 1.8504	53 / 2.0866	60 / 2.3622

OTHER SIZES UNDER DEVELOPMENT

NADELLA ALSO MAKE

- Needle rollers
- Needle bushes
- Needle roller bearings
- Cam followers

133 à 137, BOULEVARD NATIONAL, **RUEIL-MALMAISON** (S.-&-O.) - TÉL. : 967 - 1015 (+)

ACTA

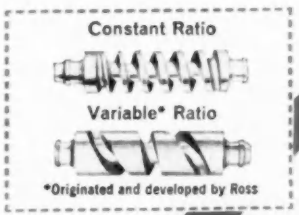
Ross variable-ratio steering has been proved in service by 31 of today's vehicle manufacturers...

including 9 of 13 makers

of heavy-duty trucks...

Ross invites

your inquiry!



Ross STEERING

ROSS GEAR AND TOOL COMPANY, INC. • LAFAYETTE, INDIANA
Gemmer Division • Detroit

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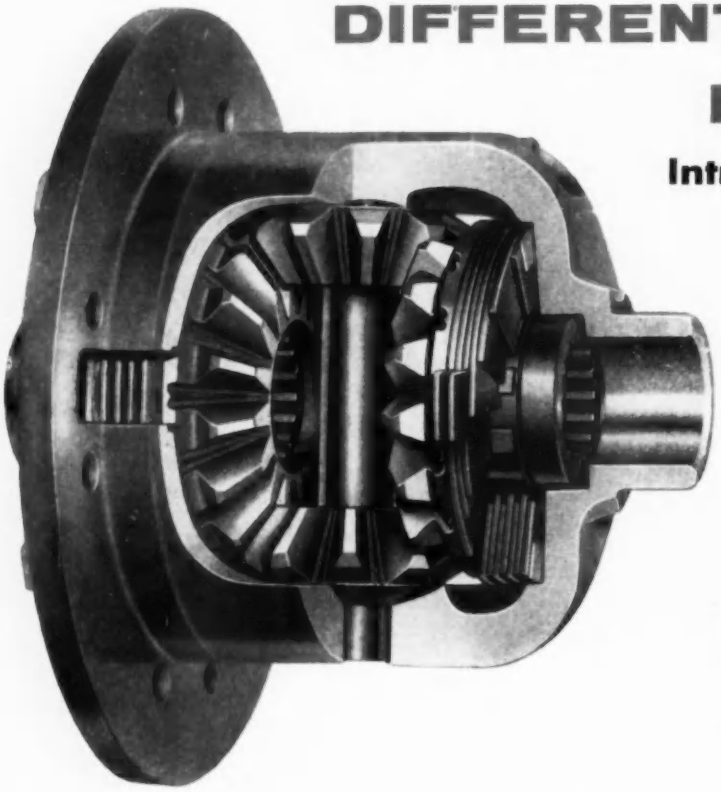
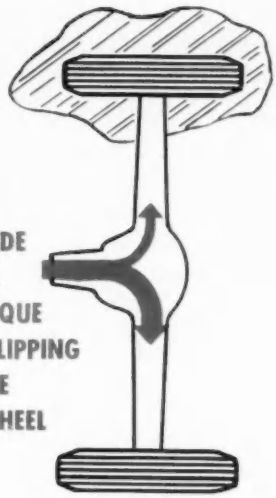
The New TRAC-AIDE DIFFERENTIAL by EATON

Introduces Long-Awaited Design Features





The TRAC-AIDE Differential by Eaton is a conventional differential, plus a simple non-locking, multi-disc friction clutch which automatically engages to retard motion of the slipping wheel, and provides smooth, chatter-free transmission of torque to the wheel with the greater traction.

The secret of the Eaton TRAC-AIDE Differential is the coefficient of friction designed into the clutch discs. This provides a stable, durable bias ratio that assures chatter-free operation without the use of special lubricants. With fewer parts and one-piece case, this economical unit is easily adapted to varied axle designs for cars and small trucks.

The Eaton Differential makes a distinct contribution to safer, more dependable vehicle operation. It has no adverse affect on steering, but actually *improves* roadability; reduces high-speed swerving and skidding on curves. We will be glad to discuss the unique design features of this new Eaton Differential with your engineers.

ONLY EATON TRAC-AIDE OFFERS ALL OF THESE ADVANTAGES

No Cams
•
One-piece Case
•
Fewer Parts
•
Easier Maintenance
•
No Lock-up Peaks
•
Improved Steering and Roadability
•
Exclusive Long-Life Disc Design
•
No Special Lubricant Required

EATON®

EATON PUMP DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

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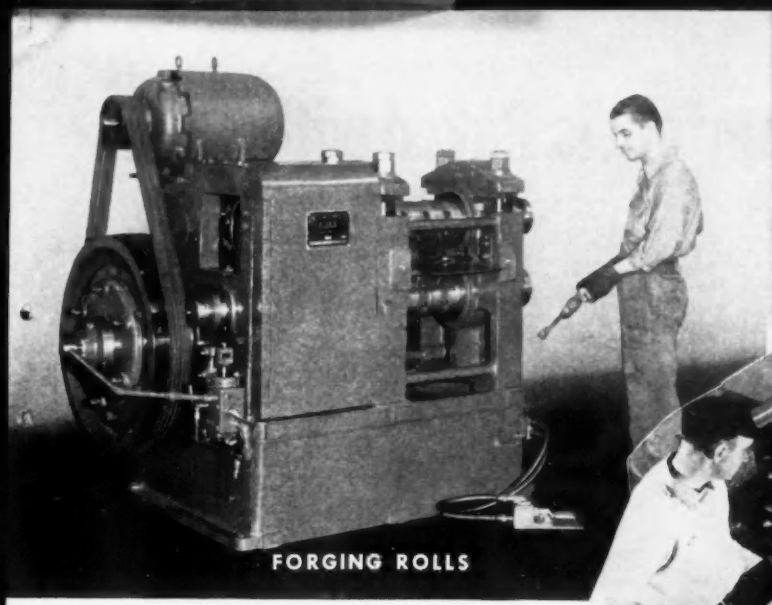
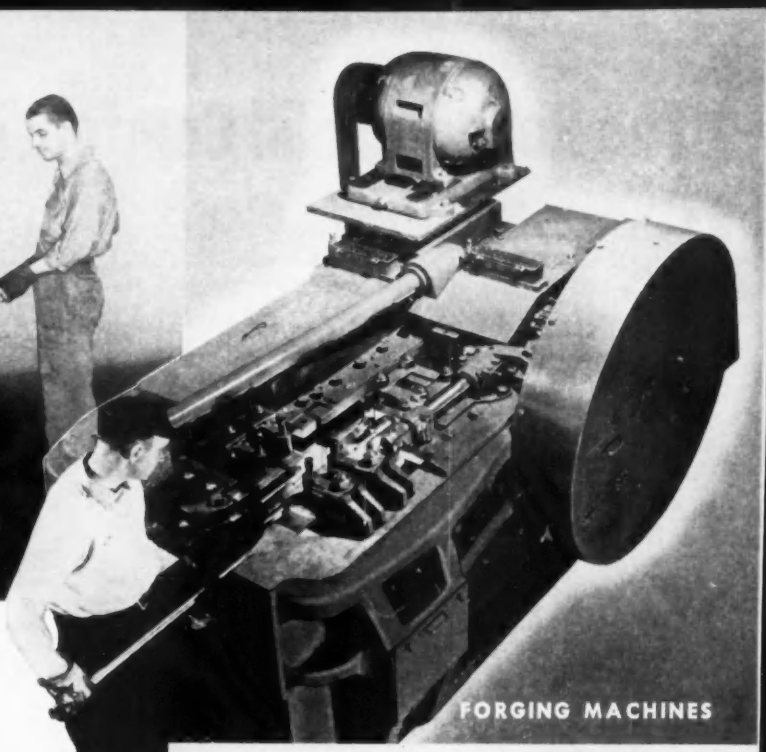


FORGING ROLLS



FORGING MACHINES

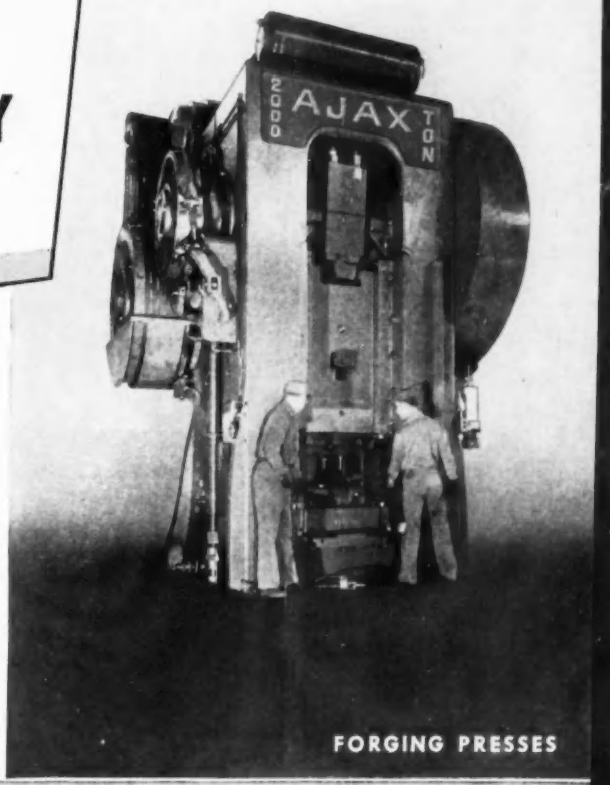
AJAX
FORGING MACHINERY
— Air Clutch Operated —
FOR
High Production

For speed in production . . . for accuracy of the forged part . . . and for capacity . . . AJAX provides a complete line of Forging Presses, Forging Machines, and Forging Rolls of the most advanced design ever offered to Industry.

Great rigidity, power and excellent alignment of these machines makes possible the production of uniformly accurate forgings with a minimum of machining.

Instantaneous response of the Air Clutch to the operator's control completes many multi-stage forgings in one heat and improves die life. Smooth, cushioned starting at high speed assures long machine life.

Write for descriptive bulletins



FORGING PRESSES

AJAX METAL WORKING MACHINES

FORGING PRESSES — FORGING MACHINES — FORGING ROLLS — AJAX-HOGUE WIRE DRAWERS

THE AJAX MANUFACTURING COMPANY . . . . . CLEVELAND 17, OHIO

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New . . . for the ultimate in Seating Comfort!

AIR-THANE . . . Proven superior to any other synthetic or latex foam. Features excellent abrasion, sunlight, ozone and solvent resistance. Possessing high tear and tensile strength, it offers the optimum in flexibility, elasticity and shock absorption qualities. AIR-THANE is available in any length, width or thickness.

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THE AIRTHANE CORPORATION

P. O. Box 9, Baden Station • St. Louis 15, Missouri

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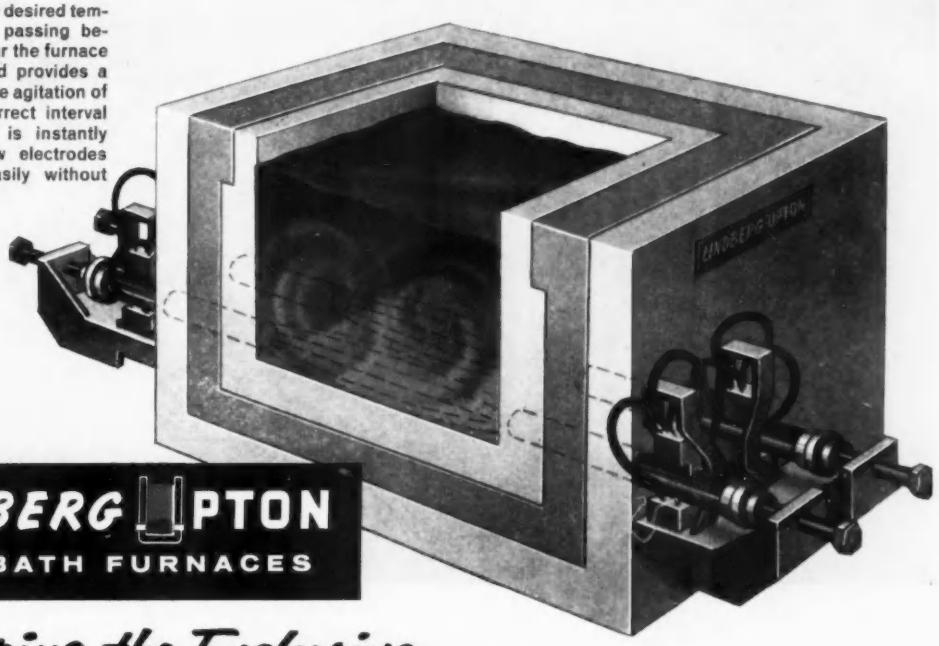
Salt is kept at precise desired temperature by current passing between electrodes near the furnace bottom. This method provides a constant furnace-wide agitation of the molten salt. Correct interval between electrodes is instantly maintained and new electrodes can be inserted easily without furnace down time.



LINDBERG UPTON
SALT BATH FURNACES

Featuring the Exclusive

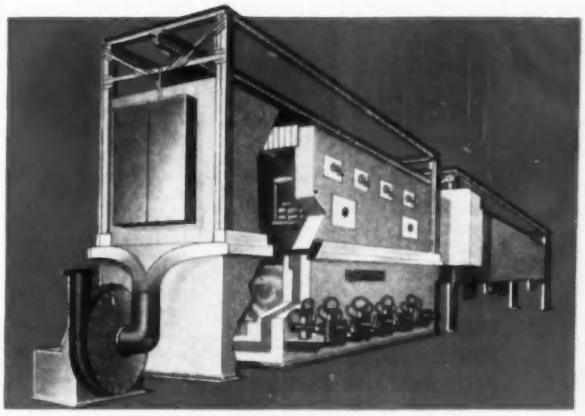
Graphite "Continuing" Electrode

MORE EFFICIENT, MORE ECONOMICAL FOR ALUMINUM DIP BRAZING

With Lindberg-Upton's graphite "continuing" electrodes you can eliminate problems inherent in ordinary high alloy electrodes for aluminum dip brazing. An exclusive feature of Lindberg-Upton Salt Bath Furnaces, these graphite electrodes also provide a superior technique for treating high speed steels and super alloys requiring extremely deep furnaces and high temperatures up to 2500° F. Here are some of their advantages:

- **No flux contamination as with alloy electrodes.**
- **No electrode replacement down time—"continuing" electrode is easily advanced as needed.**
- **Low cost—approximately $0.25 per electrode per month in aluminum dip brazing applications.**
- **Unique starting coil makes this the easiest electrode furnace to start or restart.**
- **Temperature uniformity within ± 2½° F.**
- **Unobstructed top surface area.**
- **Pot area unobstructed for fast, easy cleaning.**
- **Monolithic walls—less than 8% salt absorption.**
- **Sizes up to 50′ or more in length.**

Your local Lindberg Field Representative (see your classified phone book) will explain how Lindberg-Upton furnaces can help you. Or write us direct. Salt Bath Furnace Division, Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois. Los Angeles plant: 11937 South Regentview Avenue, at Downey, California. In Canada: Efco-Lindberg, Ltd., Toronto.



A complete Lindberg installation—preheat furnace at right, holding chamber at top left. Lindberg-Upton Salt Bath Furnace with graphite "continuing" electrodes below at left. Necessary wash tanks (not shown) were included in the final installation.

When you select Lindberg-Upton Salt Bath Furnaces you have the additional advantage of dealing with one responsible source, Lindberg, for all necessary industrial heating equipment needed to fit your production processes effectively. Here is a cut-out view of a complete salt bath installation engineered and field-installed by Lindberg Industrial Division. Single responsibility for the efficient operation of the complete unit is your best guarantee of full satisfaction.

LINDBERG heat for industry

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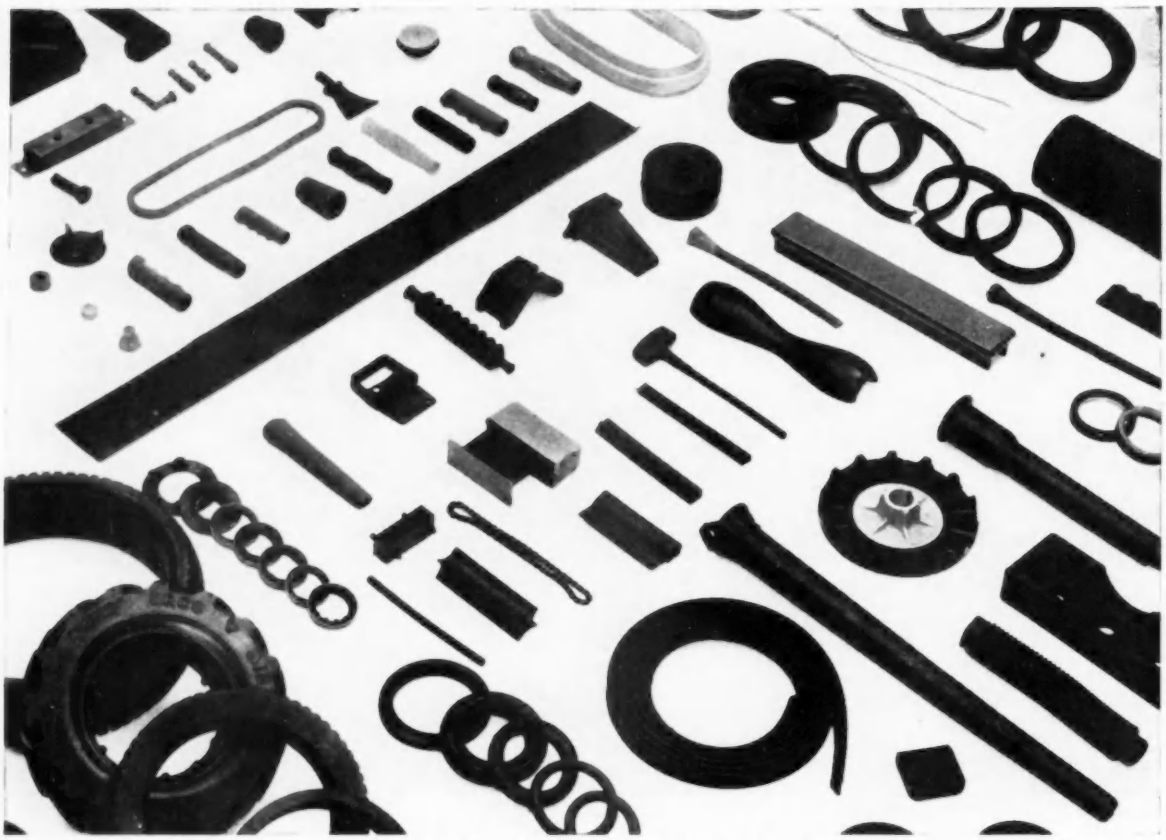

Tailor-made rubber and flexible vinyl parts produced through Ohio Rubber "Customeering" for original equipment in every industry.

How OHIO RUBBER fashions more profitable PARTNERSHIPS

An Ohio Rubber "Customeering" engineer may start with your blueprint, but he begins saving you money *after* he checks your performance requirements—what you need, where and how you'll be using your component part.

Your savings start with his recipe for the material which goes into your part. Only the essential properties required for the better performance of *your* product will be included—you will not be buying properties you don't need.

The ORCO engineer's recommendations for feasible design modifications will further help produce a better part, frequently at big savings to you.

Combined with Ohio Rubber's integrated mold and die service, complete facilities for molding, extruding, and bonding to metal, here's a profitable partnership you may want to consider for your custom-made parts of rubber, synthetic rubber, silicone rubber, polyurethane, or flexible vinyl—one that offers all the advantages of single source control and responsibility.

Suggestion: The more complete story behind Ohio Rubber's long-standing and profitable partnerships with leading original equipment manufacturers is more fully told in ORCO Bulletin 715. Write for your free copy today! 9MP1

ORCO

THE OHIO RUBBER COMPANY

WILLOUGHBY, OHIO

A DIVISION OF THE EAGLE-PICHER COMPANY

EAGLE EP PICHER

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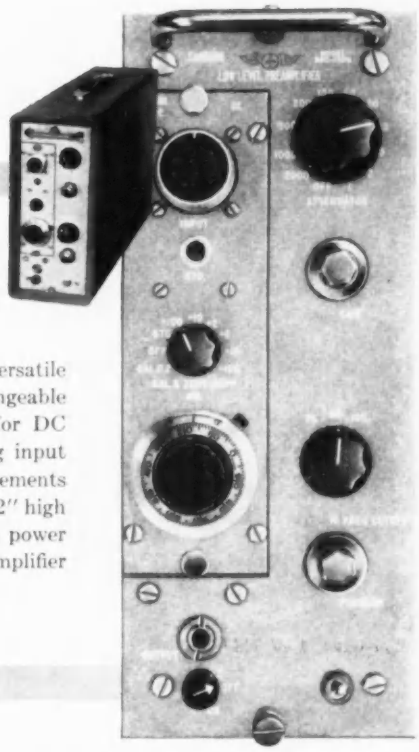
LOW LEVEL INPUT AMPLIFICATION

- *1,000,000:1 rejection ratio at 60 cps*
- *floating input*
- *isolated output*

IN 2 NEW SANBORN CHOPPER AMPLIFIERS



INDIVIDUAL SET-UPS

portable, self-contained unit amplifier

The Model 350-1500 Low Level Amplifier provides extremely versatile measurement of low level signals through use of two interchangeable plug-in circuits — one for thermocouple applications, another for DC strain gage work (other plug-ins now in development). Floating input and isolated output make the 350-1500 useful when signal measurements are made in the presence of large ground loop voltages. The 10-1/2" high x 4-3/16" wide 350-1500 may be used individually with its own power supply to drive a 'scope, meter, optical element, etc. or as a preamplifier in 6- or 8-channel 350 series recording systems.

MULTI-CHANNEL INSTALLATIONS

8-unit 7" high modules for "850" series direct writers

Compact Model 850-1500A Low Level Preamplifiers are economical, space-saving units for large installations such as aircraft and missile development and test facilities where many recording channels are used to monitor strain gage and thermocouple outputs. Required 440 cps chopper drive voltages can be supplied for up to 16 channels with the *Model 850-1900 MOPA*.

SPECIFICATIONS

	350-1500	850-1500A
Sensitivity	20 uv input for 1 volt output, or 10 chart div. with Sanborn recorder; X1 to X2000 attenuator	100 uv input for 1 volt output, or 10 chart div. with Sanborn recorder; X1 to X200 attenuator
Input	Floating, can be grounded	
Input Impedance	100,000 ohms	200,000 ohms
Output	Floating or grounded (independent of input)	
Output Impedance	350 ohms	
Output Capabilities	±2.5 volts across 1000 ohm load	
Bandwidth	DC – 100 cps (3db)	
Linearity	±0.1% of full scale	
Common Mode Performance	120 db for 60 cps and 160 db for DC with 5000 ohms unbalance in source	
Noise	2 uv peak-to-peak over a 0 to 100 cps bandwidth	
Drift	±2 uv for 24 hours	
Gain Stability	±0.1% for 24 hours	

(specifications subject to change without notice)

Complete specifications and application data are available from Sanborn Sales-Engineering Representatives in principal cities throughout the United States, Canada, and foreign countries.

SANBORN COMPANY
INDUSTRIAL DIVISION
175 Wyman Street, Waltham 54, Mass

Circle 198 on Inquiry Card for more data

Geared by FULLER . . .

BE-MAC cuts trip time 1/6 with ROADRANGER Transmissions

Be-Mac Transport Company, Inc., St. Louis, Mo., recently purchased 20 International Model DCOT-405 Tractors equipped with 10-speed Fuller R-96 ROADRANGER Transmissions.

The result: running times cut drastically and split schedules eliminated. Typical of the reduction in trip time is the company's St. Louis-to-Tulsa run. Be-Mac has shaved two hours from the 12 hours previously required for this 430 mile trip.

Company officials credit much of the sharp reduction in transit time to the semi-automatic Fuller R-96 Transmissions. With all ten forward speeds shifted by a single lever, and with short, easy steps between ratios, the 220 hp tractors can *operate in the peak horsepower range at all times. Shifting effort is reduced* and *driver fatigue is minimized.*

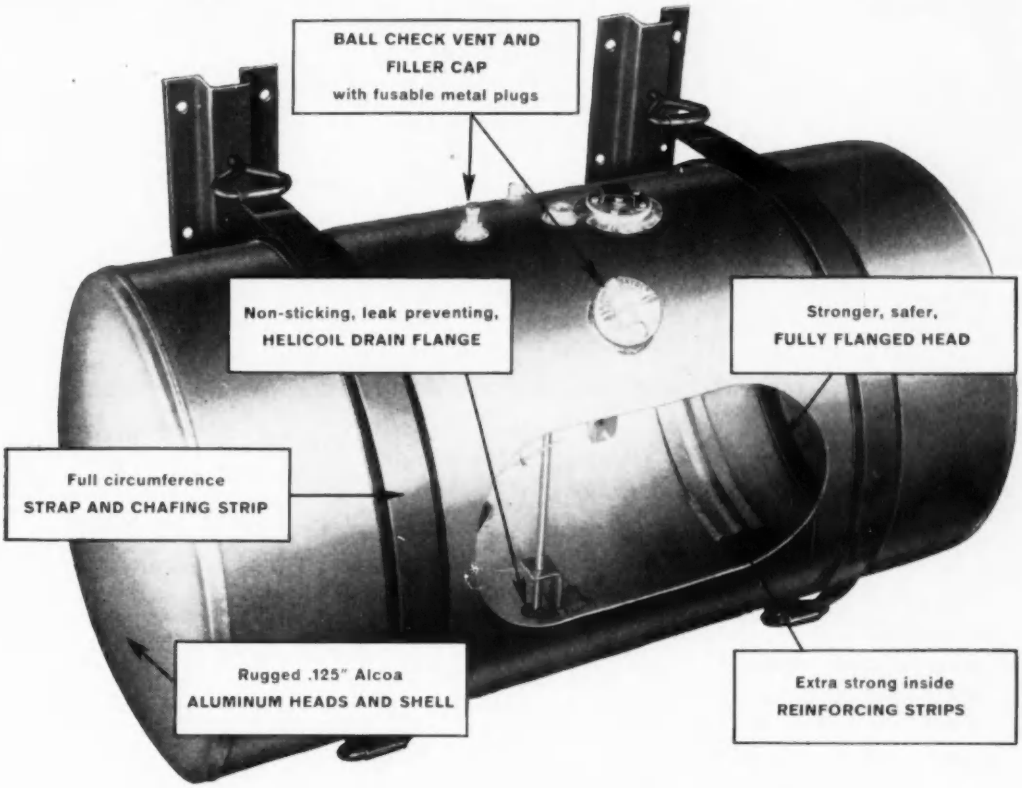
In addition to the 10-speed R-96's in the new tractors, Be-Mac operates 8-speed R-46 ROADRANGERS in their White 9000 Series Tractors. P. W. Goode, Executive Vice President of Be-Mac, says, "The reliable service we received from Fuller Transmissions in our older tractors influenced our selection of Fuller ROADRANGERS in our recent equipment purchases."

Ask your dealer for full details about the Fuller Transmission which is best suited for the requirements of your particular operation.

FULLER — TRANSMISSION DIVISION — MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN
Subsidiary EATON Manufacturing Company

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

SNYDER ALUMINUM TANKS
proven in service — cut tank weight 50%



The main reason why the up-to-date trucker picks aluminum tanks is the *increased* payload made possible by savings in weight.

But, that's just the *beginning* with Snyder because Snyder Tanks bring you less weight with no sacrifice in either strength or durability. See for yourself.

Start with the basic material of construction. It's rugged Alcoa aluminum, .125" thick, non-sparking, and resistant to corrosion. No rust, no need to paint it, ever.

Then, look *inside* this Snyder tank. Note how the inside reinforcing strips add extra strength. Next, look at the theftproof baffling that prevents syphoning.

Check, too, the helicoil spring in the drain plug. You never have to worry about sticking. And the helicoil does away with soft aluminum threads which could wear and cause leaking. Finally see how the heads are fully flanged with all seams lap welded. No weak points, anywhere.

And outside? You'll find a specially designed ball check vent and fusable metal plugs in the filler cap that provide protection in case of fire. Mounting straps run full circumference, with a bracket specially designed to prevent chafing. Naturally, the label tells you that this tank meets all I.C.C. requirements. In sizes from 37 to 72 gallons.

Write today for your free Snyder Tank Catalog. And, don't settle for just any aluminum tank . . .

Also Available...

SNYDER CENTER STEP ALUMINUM TANKS
I.C.C. LABELED FOR GASOLINE USE

Select from four models with capacities from 44 to 74 gallons. And remember, with a dual aluminum tank installation, your weight savings are doubled !

For safety, satisfaction and service, be sure to:

ALWAYS SPECIFY

SNYDER

SNYDER TANK CORPORATION

P. O. Box 14, Buffalo 5, N. Y. • Phone TRiangle 7100

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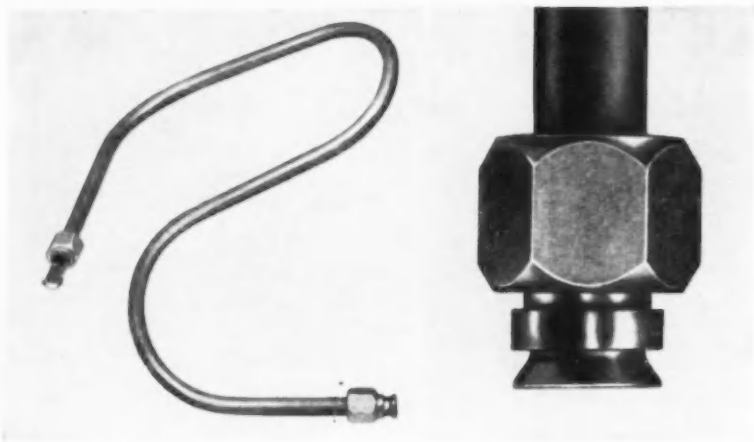
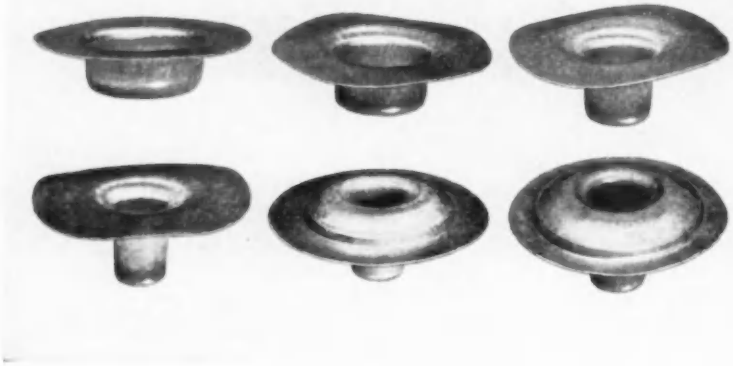
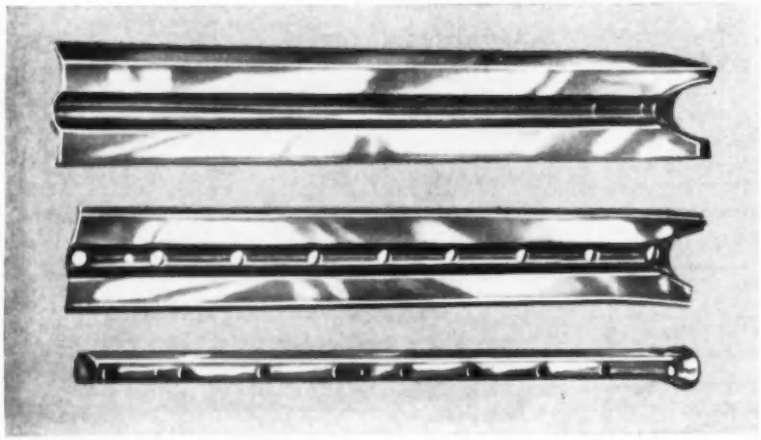
Problem-solving ideas



YOU GET MORE TUBE PER DOLLAR . . . with Republic ELECTRUNITE® Hydraulic Fluid Line Tubing. Produced in all sizes shown in the *JIC Standards Book*. Available in a wider range of sizes produced to our specification HL-1 (which meets all test requirements of the JIC Standard). Utmost uniformity assures better bending and flaring characteristics, appreciable savings in downtime. In the history of ELECTRUNITE Hydraulic Fluid Line Tubing, no failure resulting from longitudinal or transverse cracks has been reported. Send for complete information, including a copy of specifications.

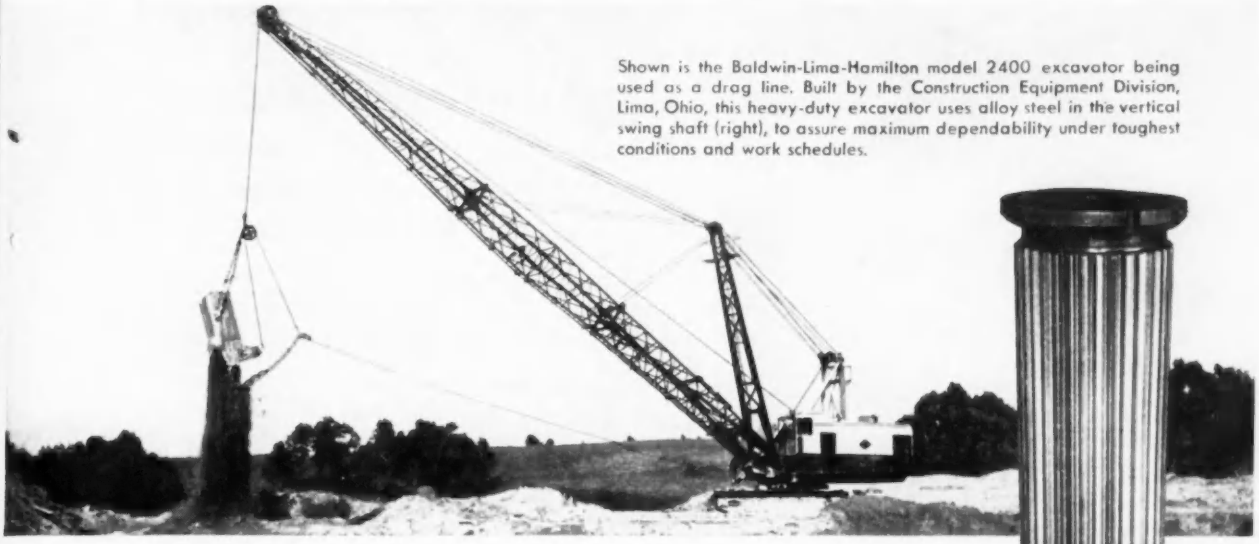


COATING DOES NOT CRACK, FLAKE, OR PEEL . . . despite many deep drawing operations performed on Republic Continuous Galvanized Sheets by the Mackenzie Muffler Company, Inc., Youngstown, Ohio. Illustrated are six steps of possibly the severest manufacturing torture that a galvanized steel sheet can take. In its final form, blank becomes a muffler end piece. Republic Galvanized Sheets can do a profitable job for you. Uniform zinc coating takes even the most severe forming operations: shear, blank, pierce, form, flange, solder, deep draw, or bead.



STAINLESS STEEL REPLACED BRASS . . . in this engine water distribution tube produced by Pontiac Motor Division of General Motors Corporation. Stainless was easily fabricated on existing tools . . . took the constant flow of hot water and anti-freeze in stride. Stainless virtually eliminated loss from bent or damaged tubes. Photo sequence shows (1) blank of .010″ stainless strip after initial drawing and embossing, (2) blank after piercing of water outlet holes and trimming of flanges, (3) completed tube after roll-forming and lock seaming.

from Republic Steel...



Shown is the Baldwin-Lima-Hamilton model 2400 excavator being used as a drag line. Built by the Construction Equipment Division, Lima, Ohio, this heavy-duty excavator uses alloy steel in the vertical swing shaft (right), to assure maximum dependability under toughest conditions and work schedules.

ALLOY STEEL SWING SHAFT WITHSTANDS SEVERE STRAIN AND SHOCK

Baldwin-Lima-Hamilton excavators and cranes offer users the latest engineering and design advances. An outstanding example is the vertical swing shaft on the line's 6-cubic yard model shovels and 7-cubic yard draglines. Subject to severe strain and impact, the shaft is made from Type 4340 hot-rolled alloy steel, of which Republic is a major supplier.

On this highly critical shaft, rotate the cab and the boom. Use of 4340 alloy steel enabled Baldwin-Lima-Hamilton engineers to design a shaft of greatly increased strength while holding weight, envelope, and cost to a minimum. The alloy is delivered in 9-inch bars which are machined on one end and splined on the other. The spur pinion is an integral part of the shaft. A jaw clutch and 24-inch diameter "V" block swing brake are mounted on the shaft.

Like Baldwin-Lima-Hamilton, you can look to Republic for the *finest* in alloy steels . . . the *finest* in metallurgical and sales service. Republic Alloy Steels offer exceptionally high strength-to-weight ratios with the highest strength values. Uniform response to heat treatment assures hard, wear-resistant surfaces around tough cores.

Republic field metallurgists will work closely with your metallurgists and engineers. Famed 3-Dimension Metallurgical Teams—field, mill, and laboratory metallurgists—will help you select, apply, and process the right alloy steel for any application. For complete information without obligation, write today or mail the coupon.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AI-8188
1141 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:

- ☐ Alloy Steels ☐ Continuous Galvanized Steel
- ☐ 3-Dimension Metallurgical Teams
- ☐ ELECTRUNITE Hydraulic Fluid Line Tubing
- ☐ Republic Stainless Steel

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

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NATIONAL LOCK FASTENERS

to your "specs"

National Lock Company sales engineers will work with you in solving all your fastener problems. Our extensive engineering and production facilities are geared to handle your requirements for special-purpose or standard fasteners of uniform quality . . . delivered on time. Write us.

"KEPS" ® REGISTERED TRADEMARK OF ILLINOIS TOOL WORKS

NATIONAL LOCK COMPANY
FASTENER DIVISION ROCKFORD, ILLINOIS

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Men at Work

in the private offices and in all corners of automotive and aviation industrial manufacturing plants, influence the buying of materials, tools, machinery and equipment.

In addition to the buyers whom your own salesmen contact

AUTOMOTIVE INDUSTRIES

reaches men whose names you'll never know — but whose recommendations may mean millions to you.

Also Automotive Industries helps to create and maintain the good reputation of your product in quarters where that help will do the most good

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Automotive Industries

A Chilton Publication

Chestnut & 56th Sts. Philadelphia 39, Pa.

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IN THE FINEST EQUIPMENT
CONTINENTAL RED SEAL POWER
Continental Motors Corporation
MUSKEGON, MICHIGAN

Dampen Vibration... Silence Noises...

ADD BEAUTY, COLOR, SALES APPEAL

WITH *Cellusuede Flock*

THE PRODUCT FINISH WITH 1000 USES

Every day product designers, industrial finish and material engineers are finding new, profitable uses for Cellusuede Flock — industry's most versatile product coating. With these cotton, rayon or acetate fibers, you can add new beauty, color, and sales appeal to your product, provide a durable protective finish, silence noises, or dampen vibration. Best of all, the soft velvet-like Cellusuede finish is easy to apply to wood, metal, plastic, fabrics, leather, cardboard, or paper surfaces, either on a modified or production line basis. It's inexpensive, more durable than fabric, and readily available in a wide range of textures and beautiful colors. Investigate today the profit possibility of using Cellusuede for your product.

FREE BULLETIN — SAMPLES, TECHNICAL SERVICE •

Write for 12-page bulletin illustrating profitable uses and applications. For help with a specific job, Cellusuede's technical service and unexcelled facilities are available for producing samples to meet your needs.

CELLUSUEDE PRODUCTS, INC.
Producers of Natural and Synthetic Flock

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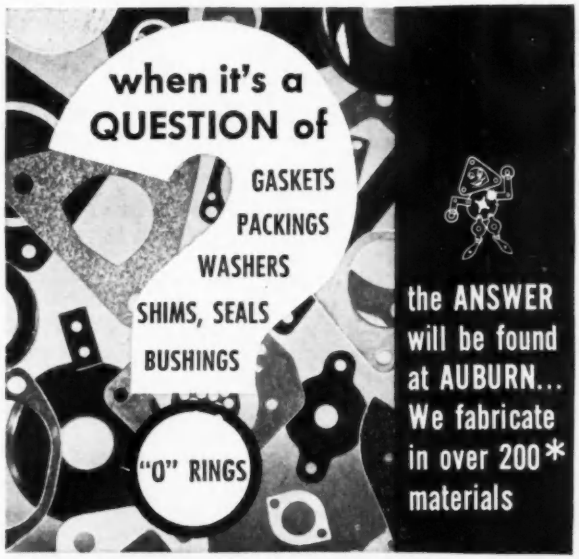

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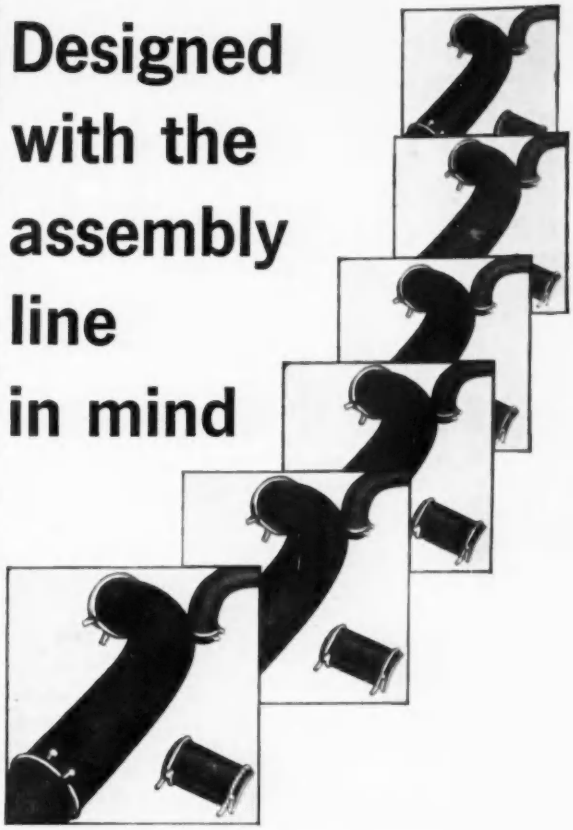
Designed with the assembly line in mind



CORBIN self-tightening hose clamps

INSTALLED IN SECONDS. Corbin hose clamps are made of tough spring steel which maintains a powerful circle of pressure around hose fitting. Once on they're tight — stay that way for the life of the hose, hot or cold. No wonder Corbin self-tightening hose clamps are "taking over" in plants where mass production techniques are employed.

Corbin hose clamps are backed by 15 years of field use and improvement. Specify self-tightening hose clamps by Corbin — there's a size for every hose fitting on your line. Fact folder HC18 gives full details and specifications.

CORBIN

CORBIN HOSE CLAMP DIVISION

THE AMERICAN HARDWARE CORP., NEW BRITAIN, CONN.

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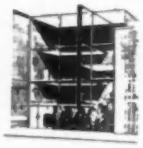
AUTOMOTIVE INDUSTRIES

A CHILTON  PUBLICATION

INDEX TO ADVERTISERS

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Specially designed, ruggedly built, to give a lasting, perfect seal in high compression engines, gasoline or diesel.

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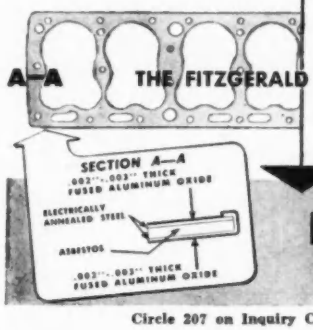

THE FITZGERALD MANUFACTURING CO.
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FITZGERALD gaskets SINCE 1906

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THE WHELAND COMPANY
FOUNDRY DIVISION

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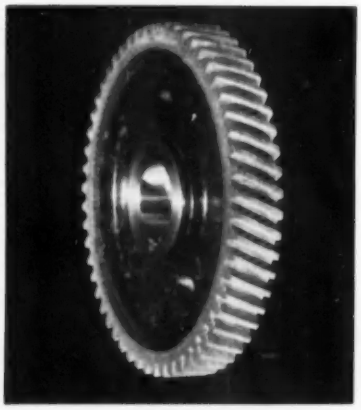
(Advertisement)

PROGRESS IN PLASTICS

CDF CELORON GEARS ARE QUIET, WEAR LONGER

Why plastics for gears? Because laminated-rim molded Celoron® gears are *quiet* (eliminate the annoying noise of chain timing and metal-to-metal gearing). Because they reduce heat and wear on mating metal gears, thereby reducing repair costs and preserving accuracy throughout the life of the engine.



Strength. Stamina is built into every CDF Celoron gear. Stronger teeth, longer running life, and smoother performance are characteristics of the Celoron gear. No type of "cheaper" gear construction has yet proved as satisfactory.

What it is. Each CDF Celoron gear blank is molded of laminated and macerated cotton cloth impregnated with a special phenolic resin. Gear teeth are cut in the laminated rim. Repeated tests prove the high impact strength, the great wear-resistance, and the low tone frequency of this "silent" gear material.

Design and purchasing men interested in adapting Celoron gears for engine-timing and other needs may obtain full technical data (properties, horsepower ratings, etc.) by writing to the Celoron Division of CDF at Bridgeport, Pennsylvania.

COMPLICATED PLASTICS PARTS AT LOW COST THROUGH POSTFORMING CDF DILECTO

How it's done. Briefly, postforming is effected by heating a special grade of CDF Dilecto® laminated plastics until it's pliable, and then forming it in an unheated, inexpensive mold.

Less expensive. When you postform Dilecto parts, you generally save money all around: Lower die costs (often wood or plastics is entirely satisfactory); lower retooling costs to meet new specifications; lower labor costs—these are a few of the savings made possible through postforming of Dilecto.

Why Dilecto? Where you need high strength-to-weight ratio, superior electrical and chemical properties, light weight, easy machinability, and excellent resistance to abrasion, weathering, and moisture—CDF Dilecto laminated plastics give you the best combination. CDF delivers either the Dilecto stock or the completely fabricated parts as specified.

Special Dilecto grades. For better response to severe bends and deep draws, and for the ability to take the most involved forming without fracturing, choose one of the special postforming grades of Dilecto, described in CDF Technical Bulletins 21 and 46. Most of the standard Dilecto grades, though, can be postformed to some degree.

SMALL ELECTRICAL PARTS BY THE MILLIONS

CDF specializes in the complete fabrication of plastics and fibre components for automotive and aircraft use. These breaker-arm bushings were made from

Dilecto tubing on automatic screw machines, by men who know best how to cut costs in working laminated plastics. Investigate CDF's extensive fabricating facilities—let CDF do the whole job, and assure your own production deadlines.

NEW CDF LITERATURE • *For Bulletins referred to in this advertisement, or for recommendations relating to your current problem in electrical insulation, send this coupon.*

Please send the following Technical Bulletin(s):

☐ Celoron Molded Gears, Bulletin C-58

☐ Dilecto Postforming Grades, Bulletins 21 and 46

☐ Please have a CDF representative call to discuss my electrical-insulation problems in detail

Name_____ Title_____

Company_____

Street Address_____

City_____ Zone_____ State_____

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE Bakelite COMPANY • NEWARK 2, DEL.

In Canada: Continental-Diamond Fibre of Canada Ltd., 46 Hollinger Road, Toronto 16, Ont.

How Aluminum Exterior Trim packages can save $10 per car

The Finest Products Made with Aluminum

are made with

REYNOLDS ALUMINUM

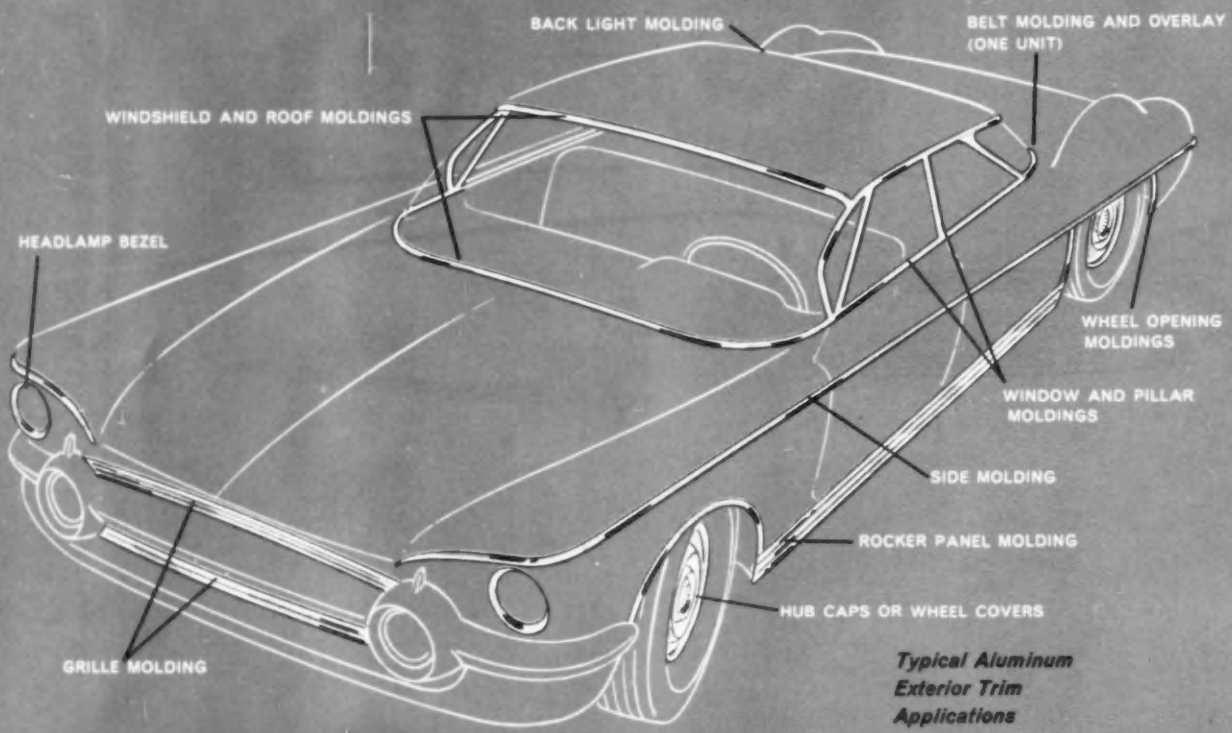
Aluminum Trim Packages give you both production savings and better part quality

Aluminum trim packages run $8.00 to $14.00 less per car than the same packages in other metals. Conservatively, the average aluminum package saves $10.00 per car. This standard package is based on body moldings, window moldings, grille, grille opening moldings and wheel covers or hub caps.

Why this substantial saving? The major reason is because aluminum is adaptable to a variety of manufacturing techniques. Because of this versatility, many savings in tooling, fabricating, finishing and assembly costs are possible only with aluminum.

As an example of aluminum's versatility, exterior trim parts can be stamped, extruded or roll formed. As a "for instance" of the former, consider a side trim overlay framed with moldings of another metal. This same part can be made as a single aluminum stamping with embossing in the overlay section and surround moldings—all in a single die approach. This saves substantially in tool and assembly costs.

Or, consider the aluminum extrusion approach to a molding. Sections can be designed and made with aluminum that can not be produced in any other manner. In addition, aluminum extrusions can be made with integral grooves for colored rubber or plastic inserts. This approach slashes tooling costs, also permits styling variations.



Typical Aluminum Exterior Trim Applications

Finishing versatility with aluminum is another important area in reducing part costs. Aluminum can be clear or color anodized. Contrasting colors can also be added through the use of organic finishes. And, paint films adhere to anodized aluminum remarkably better than to other materials used for decorative applications. This helps reduce warranty costs, means a better appearance over a longer service life.

Also, parts made of other metals must be buffed for maximum corrosion resistance. Some molding parts, if not buffed on the back, will rust with subsequent bleeding over the painted surfaces of the car. *Aluminum will not rust—ever!* In addition, in certain types of other metals, chrome flashing is required—another example of cost in finishing not necessary with aluminum.

The examples above are just a small part of the fabricating and finishing cost story of strong, lightweight, rustfree aluminum. For full details, talk to Reynolds Aluminum Specialists. They will help you plan an aluminum package that will save you money and will improve your product. They will bring you details of Reynolds services on aluminum mill products or fabricated aluminum parts. *Contact Reynolds Metals Company new sales office at Northland Drive and Northwestern Highway, P.O. Box 5050, Seven Oaks Station, Detroit 35—phone KEnwood 7-5000. Or contact your nearest Reynolds Office or write P.O. Box 2346-MY, Richmond 18, Virginia.*

NOTE: Before you buy any part—have it designed and priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower final cost.

Reynolds Aluminum

the metal for *automation*

TRADE MARK

Watch Reynolds TV shows

"ALL-STAR GOLF" and "ADVENTURES IN PARADISE"—ABC-TV

FREE LITERATURE

Finishing Machine 1

A four page color brochure describing the new Roto-Finish Vibratron precision finishing machine is available from the *Roto-Finish Co.* The literature includes a diagram illustrating how the action of the Vibratron differs from conventional barrel finishing equipment.

Electric Motors 2

Electric special application fractional horsepower motors for many industrial needs are illustrated and described in an eight page brochure prepared by *The Lamb Electric Co.*

Heat Treating 3

Bulletin T-19-C, six pages, covers units designed for carburizing, carbon restoration, carbonitriding, neutral hardening, marquenching, normalizing, annealing, and brazing. Cross-Section drawings, photographs and tables give detailed construction and performance facts on equipment which is designed to operate at temperatures up to 2000 F. *Ipsen Industries, Inc.*

Fastener Tools 4

Form 8-474, four pages, illustrates and describes Huck Model 285 and Model 287 Pneu-Hydra fastener installation tools. Performance curves showing pull capacity related to input air pressure for each tool are included. *Huck Mfg. Co.*

Aluminum Tube Book 5

A 48 page book, "Revere Aluminum Tube," contains comprehensive information on the selection of proper tube alloys, temper designations for aluminum tube and resistance of alloys to various chemicals. *Revere Copper & Brass, Inc.*

Nuclear Instruments 6

Bulletin C, 12 pages, covering the company's line of nuclear instruments and monitoring systems is announced by *The Victoreen Instrument Co.*

Separating Equipment 7

Publication of four page Bulletin 402 containing details and specifications on the full line of Techline separating equipment for barrel finishing operations in announced by *Techline Div., Wheelabrator Corp.*

(Continued on next page)

Free INFORMATION SERVICE ON

new materials and components

new production equipment

advertiser's products and services

copies of technical literature

Use these postcards for Free Literature listed on these pages, or for more information on New Production Equipment and New Products advertised and described editorially in this issue.

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FREE LITERATURE—*Continued*

Electro Clutches 8

Detailed information on its complete line of electromagnetic clutches, in six series with torque capacities from 1.8 through 13,000 lb-ft, is furnished in 20 page Bulletin R-6304. *The I-T-E Circuit Breaker Co.*

Fork Lift Truck 9

Specifications and construction features of the "C-20 Pneumatic" fork truck are contained in a four page bulletin. The machine is a gas powered, pneumatic tire truck of 2000 lb capacity designed for handling operations over rough floors in congested areas. *Clark Equipment Co.*

Soluble Oil 10

A two-color bulletin, Code AL-HD, gives physical properties, dilution ratios, recommended uses, etc., of a new soluble cutting oil formulated especially to provide maximum stability in cutting of soft alloys (aluminum, stainless, copper, etc.) *Shear-Speed Chemical Products*

Surfacing Product 11

Properties, applications, and advantages of "Emeri-Epox," a durable floor surfacing and patching material combining emery and epoxy resin, are featured in two page Bulletin EX-1. *Walter Maguire Co., Inc.*

Electro-Plating 12

Precision electro-plating services offered by *The Summit Finishing Co., Inc.*, are illustrated and described in a 12 page brochure.

Metal Spray Powder 13

Engineering Data Sheet 57 describes the new Colmonoy C-290 crankshaft metalspray powder. The sheet discusses physical properties of the material and illustrates some of the steps in its application. *Wall Colmonoy Corp.*

Vacuum Equipment 14

A 16 page product summary and price list that classifies vacuum equipment and components by type and code number is available from *NRC Equipment Corp.* Over 600 listings covering pumps, valves, gages, seals, furnaces, and many other types of accessories and supplies are included.

Generators 15

Catalog 6000, 16 pages, lists and fully describes all basic models of the Oster line of precision made motortach generators, sizes 8 to 18, for scientific, military and industrial applications. *John Oster Mfg. Co.*

Grinding Wheels 16

A four page color folder describing cylindrical grinding wheels sets forth an explanation of the desired characteristics of cylindrical wheels. It covers the abrasives and bonds used for various cylindrical cutting operations. *Macklin Co.*

Metal Cleaning 17

"Some More Good Things to Know About Metal Cleaning," published by *Oakite Products, Inc.*, contains 28 pages of information and discusses the chemistry and techniques of cleaning; tank cleaning, with suggestions for tank design and layout and selection of detergents; electrocleaning, barrel cleaning, machine cleaning; and ultrasonic cleaning.

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ORDER YOUR NEW SUBSCRIPTION Now!

FREE LITERATURE— *continued*

Milling Cutters 18

A 36 page engineering manual on a line of multiple thread milling cutters and fine pitch gear hobs has been issued. It contains much material on all phases of threading by the multiple thread milling process and the hobbing of fine pitch gears. *The Hanson-Whitney Co.*

Fork Lift Trucks 19

Catalog BU-451A, 16 pages, is a pictorial review of the FT Series fork truck now available from the *Engine-Material Handling Div., Allis-Chalmers Mfg. Co.*

Automatic Control 20

Systems for full-scale automatic control in plants, refineries, and pipelines are described in four page Bulletin 3019 published by the *Consolidated Electrodynamics Corp.*

Metal Processing 21

A 40 page catalog on machinery and machinery systems for metal surface processing (cleaning, washing, rinsing, drying, and spraying, flow and dip coating) is available from the *Ransohoff Co.*

Flanged Tool Holders 22

A catalog describing a recently introduced line of adjustable flanged tool holders for use on turret lathes and hand screw machines is available from the *Gahr Machine Co.*

Rubber Parts 23

Bulletin AD-167, six pages, describes various types of molded and extruded rubber parts for use on automobiles, aircraft, machinery, etc. The Booklet categorizes available rubbers in six groups and offers a detailed description of each type along with typical applications. *The Garlock Packing Co.*

(Continued on next page)

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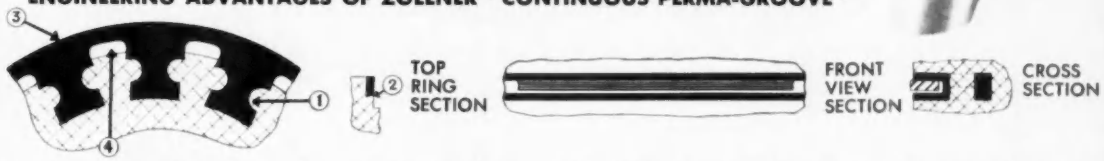

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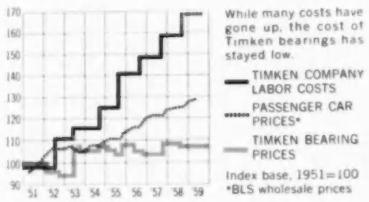

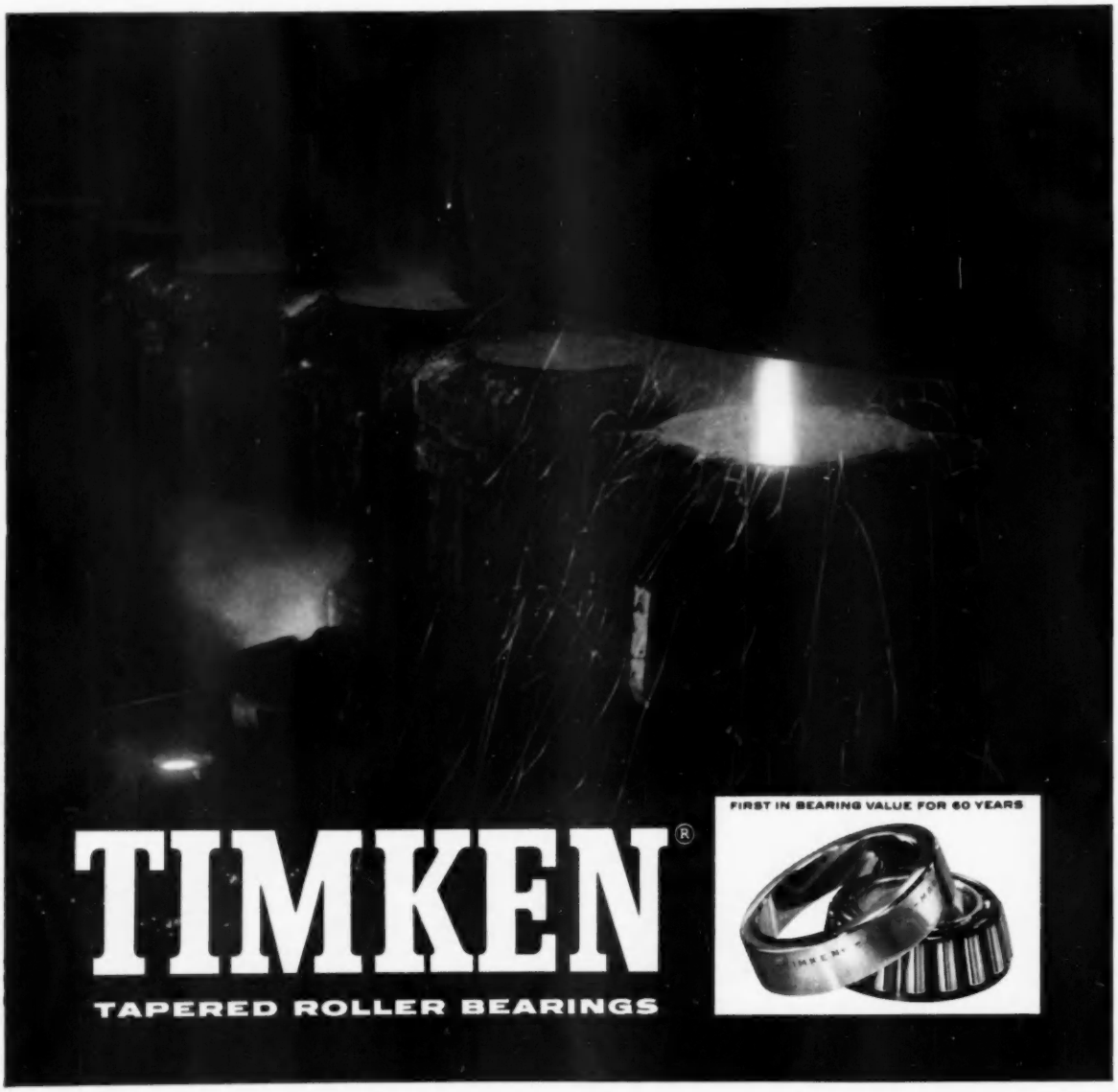

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